DOCUMENT RESUME

ED 098 392 CE 002 494

AUTHOR Cheshier, Stephen R.
TITLE Analysis of Textbook Requirements for an Associate Degree Level Electronic Communications Course as Reported by Technology Teachers in the Field.
PUB DATE Jun 74
NOTE 98p.

EDRS PRICE MF-$0.75 HC-$4.20 PLUS POSTAGE
DESCRIPTORS Communications; Educational Assessment; Electromechanical Technology; Higher Education; Post Secondary Education; Questionnaires; *School Surveys; Tables (Data); *Teacher Attitudes; *Technical Education; *Telecommunication; Textbook Evaluation; *Textbook Research; Textbook Selection

ABSTRACT

The overall goal of the study was to determine if a new text in electronic communications should be written, and if so, the nature of its content, depth, and format. A review of current related studies and study objectives are presented. A questionnaire was mailed to 50 post secondary technical schools, with 40 responding. Seven major objectives along with significant findings are listed. Tables detailing the areas of agreement concerning desirable text topics, textbook treatments, and other research findings are included. The study determined that present textbooks in electronics communication were rated below average by 62 percent of the teachers surveyed and that teachers have been changing texts about every three full semesters. Strengths and weaknesses of current texts are discussed and recommendations concerning the format of a desirable new text suggested. The appendix includes the questionnaire, summary of the study, comments received on the questionnaire, and statistical computations and tabulations. (MW)

ANALYSIS OF TEXTBOOK REQUIREMENTS FOR AN ASSOCIATE DEGREE LEVEL ELECTRONIC COMMUNICATIONS COURSE AS REPORTED BY TECHNOLOGY TEACHERS IN THE FIELD

A STUDY

BY

STEPHEN R. CHESHIER, M.S.E.

ASSISTANT PROFESSOR IN ELECTRICAL TECHNOLOGY

PURDUE UNIVERSITY

JUNE 1974

Dedicated to those busy

faculty members who nevertheless

took time out to fill out a lengthy

questionnaire to in a small way

help future students.

ACKNOWLEDGEMENTS

Sincere thanks is given to Dr. Rupert Evans of the University of Illinois for his help in many ways with this study.

Thanks is also given to the Industrial Education Department at Purdue University and especially to Dr. A.R. Suess whose criticism of the questionnaire was most helpful.

To the faculty members in Electrical Technology whose expertease was often drawn upon.

And especially to those who responded to the questionnaire and offered their advice and ideas.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Cheshier, Stephen Robert. M.S.E., Purdue University, March, 1974. Analysis of Textbook Requirements for an Associate Degree Level Electronic Communications Course as Reported by Technology Teachers in the Field.

A sample of fifty was surveyed from the population of teachers of electronic communications at the Associate Degree level in order to determine their desires concerning the proper content, format and structure of a desirable textbook in this field.

The study was based upon the premise that most textbooks currently available in this field are unsatisfactory and that a new text, more in line with the current thinking of professional teachers as well as students around the country, would be desirable.

The survey questioned those teaching in ECPD accredited programs as well as those in non-ECPD accredited programs. Attitudes were compared on such topics as opinion of the current text, desirable text characteristics and format, desired depth of coverage as well as the relative importance of specific subjects. Data was also gathered on the titles of texts currently being used, the number of years the respondent has taught this subject and the number of textbooks previously used by the respondent. Many excellent additional comments were received and they have been tabulated.

Specific expectations have been compared with the collected data and some excellent insight into the makeup of a communications text may be gained by analyzing the results of the study.

INTRODUCTION

Problem Statement

It was the purpose of this study to gather data from a stratified random sample of electronic communications instructors around the nation concerning the adequacy of currently available textbooks in this field.

An instrument has been distributed which has been designed to determine the content and depth of coverage of a textbook that would satisfy the majority of the sample. Preferred format of a text has also been determined and the results have been tabulated.

The overall goal of this study was to determine if a new text should be written and, if so, the nature of its content, depth and format. It was realized that nothing more than general answers to these questions could be anticipated since a brief questionnaire does not allow complete expression of opinion to the depth that would be desirable. The researcher was prepared to accept these limitations since it would be necessary to make the study far more extensive (and thus expensive) in order to gather significantly more data. This would also place an additional burden on the respondent who already has been asked to fill out a rather lengthy questionnaire. If even the modest goals of this study are achieved, potential authors in this field will be armed with more information about what is desired and needed in a new textbook than textbook writers usually enjoy. Also classroom teachers will be more aware of the consensus of their peers as to what should be included in their courses.

General Background

It has been the author's observation that one of the most difficult subjects to teach in an Electronics Technology college program is "Electronics Communications". This is not necessarily because communications is inherently more difficult than any other area within the expansive electronics field, but because of the broad range of topics which may be legitimately placed in this area. It thus becomes almost impossible for an instructor to decide which topics are the most important and relevant so that a one semester survey course can be planned. Unfortunately, time will usually permit only a one semester communications course in the typical two-year associate program. This is especially true since all of the fundamentals must be taught as well as related subjects required for program accreditation in the all too short two years. Such necessary electrical electives as industrial controls, power generation, digital electronics and instrumentation and troubleshooting all vie with communications for a slot in the curriculum.

The communications course must be a survey of the entire field since the one course may be all the two year graduate gets. Four year programs provide a continuation of several courses typically in communications and if it were known that all two year students were continuing into the B.S. program then many important topics could be delayed until then. Unfortunately this is not the case. Even in four year programs many students stop at the two year point to go into industry. Thus the two year program must stand alone and those necessary communications topics must be identified and placed into a one semester survey course.

The problem is further complicated by the fact that, although almost all curricula include an elective survey communications course, these courses are often taken by those at all levels in the program. This makes pre-requisites very difficult to specify. Usually only the most basic electrical and electronic courses (e.g. those taken in the first year of a given program) are assumed to be the pre-requisites.

The author has observed that few schools teach the same topics in their communications course. Although minor variations would be expected among different schools, major differences in course content perhaps would not be expected. As a result of these divergences, numerous communications textbooks, each quite different, are available. Opinions expressed to the investigator by colleagues at conferences and meetings over the last several years have indicated that there is wide dissatisfaction with the range and the content of textbooks currently available. Consequently, a text is often chosen not because it will support and strengthen the class work especially, but because it is likely to do the least damage.

Having recently taught from four different communications books and having found them all inadequate for the needs of the students, the investigator became motivated to undertake a study to see if these problems were in fact generally felt. In addition, if problems did generally exist, this study attempted to classify them.

If these problems did exist, as the author supposed, a final and culminating goal of this study would be to use the results in the formulation of a new textbook in electronic communications.

This book would be written in an attempt to satisfy the demands of questionnaire respondents (who it is assumed represent technology teachers in general) regarding textbook content, depth, format and "teachability".

REVIEW OF RELATED STUDIES

In reviewing the literature the author did not have the usual reasons as motivation for his study of other research. The subject of this study is a very narrowly restricted one (electronic communications textbooks) and it was not expected that there would be other studies based on this same premise. This proved to be the case. The author was not motivated to undertake this study necessarily because of observed weaknesses or inconsistencies in other studies but because there had apparently been no previous work in this area. In looking for information to use to form an intelligent base for designing a communications course, it was found that virtually no feedback had been published relating to the opinions of teachers in the field on the subject of electronics communications. Thus there was little in the published literature upon which to draw. Also, although the author certainly hoped to broaden the base of knowledge in this area, a more pressing concern was the desire to write a textbook in the communications field and the need for accurate data from its potential users so that it might adequately reflect the desires of those who would be using it. One pitfall which the author hoped to avoid was writing a book which was simply a re-hash of his own pet subjects and philosophies ("ax grinding") rather than one which truly reflected the needs and desires of teachers and students around the country.

Thus after reviewing the literature and noting that there were no previous studies (at least in the libraries to which the writer had access) in the specific area of electronics communications textbooks, it was decided to draw upon the expertise of an electronics faculty and an industrial education faculty to ascertain those things which would be most appropriate to ask in a questionnaire in order that a reasonably representative book might later be written.

Although the published literature did not contain any work on the specific subject on which this study is based, it was nevertheless, very helpful in other ways. Studies were available in the areas of curriculum, course content, questionnaire design and textbook assessment and suitability and valuable insight was gained in reading these studies.

Bas (1950) in a study of electronics curricula identified major areas within the electrical technology spectrum. He found electronics communications to be one of the necessary four major areas. In his analyzing of curricula around the country as well as looking at the needs of industry his results clearly show the importance of a survey course in electronic communications. This study would also imply that communications is a very standard, necessary subject which one would expect to find in virtually all electronics post secondary programs.

The idea of using a questionnaire to gather information on course content gained impetus after the author's reading of a study by Gillie. Gillie (1967) identified topics of importance for an electronics course. More importantly (to this author) was the fact that he used a questionnaire and sampled the opinions of teachers around the country to get a concensus on what topics ought to be included in the course (a course

in electrical fundamentals). He found, after analyzing his results that there was excellent agreement among the teachers on the topics that should be in the course as well as upon their relative merits. This was a most encouraging finding since this report uses the same technique.

The idea of using teachers in the field as sources of information was also reinforced in a study on not only content but also format, sequence and depth of coverage. Pankowski (1966) used a survey technique and got excellent agreement from electronics teachers on content, format, sequencing and depth of coverage in four electronics courses. This author felt that the study was too broad and was amazed that the agreement was as good as it was on such a broad area as four electronics courses. This did provide further hope that agreement could be achieved in the area of one electronics course. Mills (1967) also used the survey technique with success to identify electrical technology knowledge clusters and again good agreement was achieved from the participating teachers.

The concept of having a panel of teachers look at a book after publication and voting on its suitability for a given course was investigated by McCain (1959). Surprisingly, he found less agreement among teachers at this stage than the previously mentioned studies did. Thus although there seems to be significant evidence that teachers can agree what should be in a book, once a book has been written there seems to be less agreement that it is suitable than this author would have expected.

Therefore, whereas some of the studies gave encouragement for the use of a survey to gather communications topics, the McCain study points up the danger that even though teachers may agree on what

should be in a book, these same teachers may not be satisfied that a book based on their chosen topics actually meets the need. This will be important to remember when the author actually writes the textbook.

Numerous studies exist on the usefulness of questionnaires and on sampling techniques.

The writer benefitted most, however, from these representative ones:

Schweinfurth (1969) obtained desired behavioral objectives for a prospective course by using a questionnaire to survey experts in the field. There was enough concensus from his subjects (industrial people, not teachers) that he was able to develop a new course based on the collected data. This also reinforces the idea of using peer ideas to structure a course.

Although based in this writer's opinion on much too large an area, Bekton (1956) used the questionnaire technique to gather data on both content and suitability of some 75 textbooks used in teacher education. Since he chose to work with such an expansive listing of books, his questionnaire was not nearly as specific or as revealing about each individual book as this author's should be. The results, although necessarily vague, nevertheless reinforce the suitability of a questionnaire to gather this kind of content information.

Gillie (1967) used a 72 item questionnaire to gather curriculum content opinions. He found the questionnaire to be one of the few ways to obtain accurate information on how courses should be structured. Since structuring a text is basically the same problem as structuring the course in which it will be used, the validity of

the questionnaire (according to Gillie's findings) for this purpose is encouraging for this study.

The study that perhaps most nearly parallels the author's study (and therefore one of the most useful ones) was done recently by Slatter (1970). He used the questionnaire technique to determine specific needs for updating electronics courses as reported in his survey of teachers in the field. Although he did not deal with electronic communications, he did seek information on such things as overall course content, new advances and key topics necessary for inclusion into his courses. He claimed that the questionnaire technique produced results from his peers that were most useful.

In addition to the research in related areas which has been summarized here, the author found it necessary to draw heavily upon established reference works in the areas of questionnaire design, sampling techniques, statistics and educational research.

Questionnaire Design and Attitude Measurements by Oppenheim contained many valuable suggestions which were implemented into the questionnaire used in this study. Survey Sampling by Kish contained useful information about selecting samples, biases that can occur and the whole area of questionnaire type surveys. Basic Statistical Methods by Downie and Heath was very useful in determining which methods would be used to analyze the data contained in the questionnaire. Finally Understanding Educational Research by Van Dalen was extremely valuable since it discussed the entire problem of educationally related research in a very readable and understandable way. Especially valuable were the sections on processing data and writing a research report.

Although certainly helpful to the author, the related studies suffered from several limitations in their applicability to this research. The obvious limitation, of course, was that none of the studies dealt with electronics communications specifically although some did deal with closely related subjects. Also it is felt that those studies most closely related to this one dealt with much more diverse samples and were not as limited in scope as this study. Since those studies reported success, one could infer that a more limited study might be even more productive. This researcher hopes that is the case.

OBJECTIVES

The study proposed to answer these questions:

1. What textbooks are currently being used in electronic communications courses at the technology level?

This question is important in that the response will indicate which books are popular and most often used. Since the author is familiar with most texts in this field he will be able to draw conclusions about the general type of book most often preferred by teachers.

Expectation (1) It would be expected by the author that the ECPD accredited schools, due to the rigorous accreditation requirements and the required high academic training required of the faculties, would use books in the more theoretical end of the spectrum such as Kennedy, Zeines, Taub and Schilling or Clark and Hess. It would likewise be expected

that non-accredited schools would be more apt to use less theoretical and more practically oriented books such as DeFrance, Mandl, Shrader or Kaufman.

2. Do the majority of respondents feel satisfied with the text they are using?

This question is a crucial one as far as the researcher's desire to write a new text is concerned. Obviously, if virtually all respondents are well satisfied with their current textbooks, there is no apparent reason to introduce yet another book.

Of course even if the respondents are well satisfied it presumably would be possible to construct a book in such a way that it would be even more desirable to them but it would certainly be more desirable if they were not satisfied with their present book.

Expectation (2) If the assumptions underlying this questionnaire are correct (i.e., there is in fact a need for a new book) then one would expect more respondents to mark the categories "satisfactory" or "poor" than would mark "good" or "exceptionally good". This should hold true across both the accredited and non-accredited samples. It would not be expected that anyone would mark "unsatisfactory" since it would be unlikely (although not impossible) that a teacher would specify a book for use that he himself deemed unsatisfactory.

3. How often are communications textbooks typically changed?

Based on the assumption that the useful lifetime of a technical book does not exceed ten years due to rapid technological advance, one would still assume that a good book with which a teacher was well satisfied, would be used five years before being replaced or updated. If books are changed far more frequently than that, one could make inferences about the usefulness of the textbook.

Correlations need to be made between the number of text changes and the years of teaching experience of the teacher so that opportunity to change be considered (i.e., a teacher with one year of experience may feel obligated to use the book his predecessor used).

Expectation (3) It would be expected that among experienced teachers, textbooks would be changed significantly more often than once in five years if the books are in fact inadequate.

4. Given a list of alternatives, can teachers select strengths and weaknesses of the textbook that they are currently using? Will there be agreement on the strengths and weaknesses?

Concensus of any kind will be looked for here.

Expectation (4) The author has preconceived expectations on only two of the nine characteristics. It has been his experience that most textbooks used do not have enough "real world" examples and are not well liked by the students. These two expectations will be especially tested and scrutinized.

5. How will teachers rate each of the below items in importance concerning desired textbook format?

   a. behavioral objectives

      Expectation: The ECPD sample will find them to be more necessary than the non-accredited sample.

   b. chapter overviews

      Expectation: none

   c. summaries and sub-summaries

      Expectation: none

   d. questions at the end of chapters and at the end of topics

      Expectation: none

   e. problems at the end of chapters and at the end of topics

      Expectation: Since electrical technology is basically a problem solving, hardware oriented discipline, it would be expected that the inclusion of problems will be of extreme importance.

   f. self tests

      Expectation: none

   g. photographs and drawings

      Expectation: Since technology is a real world, hardware, hands-on oriented program which tries to maintain an industrial orientation, it is expected that respondents would find photographs and drawings to be essential.

   h. sections of definitions

      Expectation: none

   i. unification of topics into an overall plan

      Expectation: none

6. Given a list of possible topics to be covered in a survey communications course, will the respondents agree on those topics that are most important and least important? Will the ECPD group come to the same conclusions as the non-accredited group?

   Expectation: Although the author could go down the 117 item topic list in the questionnaire and readily mark those topics which he feels are important, the primary purpose of this study was to see how others feel about the relative importance of communications topics. Therefore, although concensus will certainly be hoped for and tabulated if it exists, the author will not presume to predict in advance which of the 117 items will indeed achieve concensus.

7. How important are each of the following types of treatments in a communications text?

   a. mathematical proofs and derivations and theoretical explanations

      Expectation: It would be expected that these would be more important to the ECPD sample but not especially important to any of the population.

   b. analysis of typical circuits

      Expectation: none

   c. survey treatment of most topics

      Expectation: The samples will agree that survey treatments are enough for this level of a technology program.

d. underlying principles stressed

Expectation: This would be expected to be important.

e. coverage of specific industrial devices and applications

Expectation: Based upon the author's concept of the role of a technology program this would be expected to be very important in the eyes of the respondents.

f. laboratory verification of key ideas

Expectation: Again based upon the "hands-on" orientation of technology programs, one would expect this to be very important to the respondents.

g. coverage of newest devices

Expectation: none

METHOD

Population and Sample

The population for this study is all teachers of electronic communications whose schools are listed either in American Junior Colleges (Eighth Edition) or the "List of Accredited Curricula Leading to Degrees in Engineering Technology, 1972" (Engineer's Council for Professional Development (ECPD)). The latter was published in 1973. These two sources represent the majority of college level postsecondary programs in the United States.

A stratified random sample (accredited vs. non-accredited programs) was used so that the data from ECPD accredited schools could be compared in selected areas to data from non-accredited programs. It was important to the researcher to know how these two groups compare in their textbook requirements. If the requirements were significantly different, it could be the subject of another study to probe the reasons. In addition, prospective authors using the results of this study would have to decide whether to write for the needs of accredited or non-accredited programs.

The sample was chosen using the following technique:

ECPD sample - the seventy-eight schools offering accredited electronics programs, as listed in the most recent document from the Engineer's Council for Professional Development, were numbered consecutively and a sample of twenty-five schools were selected using a table of random numbers. Purdue was omitted before selection since it is the home school of the author.

Non-accredited sample - a sample of twenty-five schools from the two hundred plus listed in American Junior Colleges was chosen in the same random manner as the ECPD sample. Prior to selecting this sample, those schools which were in this book which also happened to be ECPD accredited were eliminated. Only schools granting at least the A.A.S. degree were considered.

The overall sample thus included fifty schools. The ECPD sample is listed in appendix A while the non-ECPD sample is specified in appendix B.

The Instrument

The instrument was a questionnaire (see appendix C) which contained those questions which were necessary to complete this study. The objectives of the study formed the basis for the selection of the questions. In addition to satisfying the objectives of the study more needs to be said about question seven (the bulk of the questionnaire). The basis for topic selection in question seven was simply to list those topics which have been traditionally included in communications books as well as those newer topics currently appearing in the technical literature. The researcher feels that the list is very complete but, in this and other questions, spaces were provided for any additions that the respondents felt to be necessary. Topics were listed in an un-associated order to force the respondents to consider each item individually on its own merits. Several internal checks have been placed into question seven to allow the author to check for validity.

The questionnaire was evaluated, prior to use, by several electronics instructors and vocational educators to insure that it was as clear and concise as possible prior to mailing. Their suggestions were quite helpful and the questionnaire in its final form reflects several of their suggestions.

The questionnaire was professionally printed and an odd-even numbering technique was applied so that the researcher might be able to identify and categorize the responses.

Every attempt was made to make the questionnaire as clear and straightforward as possible, thus no operational definitions were deemed necessary.

The questionnaire was mailed, along with a cover letter of explanation (appendix D), a stamped self-addressed return envelope and a brief note that it be forwarded to the teacher of electronic communications, to the department head of the respective electrical technology departments. The total cost of printing and both the initial and follow-up mailings was $68.00. This compares to a pre-study prediction of $32.00 (a significant under-estimation).

Although the cover letter encouraged response, and it was hoped that those surveyed would want to respond, plans were made for a follow-up letter (appendix E) and another questionnaire to be sent so that as many of the fifty questionnaires as possible might be returned. The follow-up mailing occurred six weeks after the initial mailing. Up to this time the questionnaires had been coming in on a fairly regular basis. Only one follow-up was made since the original mailing and the first follow-up resulted in an eighty percent return.

A very brief summary of the results of the questionnaire (appendix F) was prepared and mailed to all respondents upon completion of the study.

Statistical Technique

In discussing the statistical base of this study with a professional statistician, the author was advised that in a study of this type the best approach is to present the data in the most straightforward way possible letting the data speak for itself where possible and using statistics to clarify and illuminate. This seemed to be excellent advice and every attempt was made to heed it.

Three frequency distributions were made for the data in the first question. The ECPD, the non-ECPD and composite data were tabulated. This tabulation and popularity ranking is sufficient to confirm or deny expectation (1).

The same three kinds of frequency distributions were made for the data in question two. Here the "satisfactory" and "poor" totals needed only to be compared to the "good" and "exceptionally good" categories to answer expectation (2).

The mode is useful here and was also indicated.

Questions three and four were correlated together so that a number representing "number of text changes per year of teaching communications" could be found. The mean of these numbers was then compared to the author's assumption that one change in five years is typical for a good book. The correlation between the number of years teaching communications and the number of texts used was tested for significance at the .01 alpha level.

To answer expectation (4) which is based upon question five, concensus of agreement between the two groups was looked for. A Chi Square test was performed to see if disagreement existed which was significantly greater than what would be predicted by chance alone.

An alpha level of .05 was considered significant in this test. Although the areas of agreement and disagreement could be tested statistically, some arbitrary cutoff had to be assigned when considering what ratio of "yes" and "no" answers represented significant likes and dislikes in a text.

The researcher arbitrarily decided that if as many as one out of three (or more) respondents found a text unsuitable in a given category, that would be considered a significant weakness of communications textbooks being used, in that category.

Questions six, seven and eight were presented in the same basic format in the questionnaire. Frequency distributions were made but overall means and variations were not as important here as individual frequencies and thus were not computed. Simple percentages illustrate this data best and were tabulated.

The Chi-Square technique was used on question six to probe for areas of agreement or disagreement (at the .05 alpha level) between the two groups. In evaluating the necessity to include or exclude each text characteristic in question six, a two-thirds majority was considered significant. This majority is certainly relevant to the author in his desire to compose a new text but statistically it is somewhat arbitrary.

Question seven proved to be burdensome to analyze. Due to the large number of items in this question (117) it was difficult to decide how to present the results of the data in a readable and understandable format. Simple percentages of responses by each group in each category for each item were tabulated and then were tested for agreement or disagreement using Student's t statistic (corrected for small sample size) with an alpha level of .01 being considered significant

The data was then presented in order from most agreement to least agreement based upon the "t" test earlier performed.

In Item 8 the responses were tabulated for each group by percentages then the t statistic was again used, this time at the .05 alpha level to determine areas of disagreement.

Simple percentages were sufficient to tabulate the data in Question 9 which dealt with the respondents' satisfaction with the instrument.

Comments made throughout the questionnaire were carefully tabulated and complete statistical computations were entered in Appendix H.

It should be noted that the "t" test used above is a modification of the Z-test for the difference between proportions, the modifications being that a correction factor (see Appendix H) was used for the small sample size in this study; the fact that the two groups were of unequal size was compensated for and percentages rather than proportions were used.

It should also be noted that alpha levels of .05 and .01 were each used at various times in making statistical tests. The .01 level was used when the author wanted to be very critical in his statistical probing so that on these items there would be almost no doubt (1 chance in 100) that the data were misinterpreted. When he was less worried about Type I Error, the .05 level was used. These decisions were based solely upon the researcher's intuition and interests and nothing else. Of course both the .01 and .05 alpha levels are powerful levels of hypothesis testing.

There were times when the author would have liked to test for disagreement at even very low levels of significance (as low as

alpha = .25) but he suppressed these urges and followed the more conventional alpha levels suggested by the eminent R.A. Fisher.

Assumptions

It has been assumed throughout this study that the samples chosen were truly representative of the population being dealt with. It has been further assumed that respondents answered the questionnaire in an honest, thoughtful and sincere manner doing all within their power to ensure that the data recorded on the questionnaire accurately reflected their viewpoints. It has also been assumed that those in the sample are relatively homogeneous with roughly equivalent formal training in electronics and a reasonable insight into some of the problems encountered in teaching electronic communications.

RESULTS AND FINDINGS

Percent Return of the Questionnaire

Within six weeks of the initial mailing, twenty seven of the original fifty questionnaires had been returned. The follow-up letter resulted in an additional thirteen responses so that a total of forty of the initial fifty were returned.

A second follow-up was not made because of the eighty percent response. Since the questionnaire was rather long and of necessity time consuming to fill out, it was not felt that another follow-up would be as proportionately productive as the first.

Surprisingly enough, after the first follow-up, all twenty five of the ECPD schools had responded with all ten non-respondents being from the non-ECPD sample.

The actual samples did not possess the same balance, then, as was originally planned due to the nature of the response.

The reader should be aware when studying the data that this numerical bias exists and that, although percentages are given and compared, the sample sizes are not equal (twenty-five ECPD, fifteen non-ECPD).

Analysis of Data

The first objective of the questionnaire was to determine those textbooks currently being used at the technology level in electronic communications.

This data can be presented in several meaningful ways as is shown in the following tables. Table I is the frequency distribution for the total sample with the categories identified. The texts are listed alphabetically.

TABLE 1

TEXTS CURRENTLY BEING USED

TEXTS	FREQUENCIES		
	ECPD	NON-ECPD	TOTAL
Clarke & Hess	1	0	1
Defrance	2	2	4
Foster	1	0	1
Froehlich	1	1	2
Grob	0	1	1
Kennedy	12	4	16
Lathi	1	1	2
Malvino	1	1	2
Mandl	3	0	3
Mitchell	0	1	1
Schwartz	1	0	1
Shrader	0	3	3
Simpson & Houts	0	1	1
Taub & Schilling	2	0	2
Zeines	1	0	1
	$N_{(ECPD)}=26$	$N_{(NON-ECPD)}=15$	N=41

It is also helpful to list the texts in order of preference for each group as is done in Tables 2 and 3.

TABLE 2

TEXT PREFERENCES FOR THE ECPD SAMPLE

TEXT	FREQUENCY
Kennedy	12
Mandl	3
Defrance	2
Taub & Schilling	2
Clarke & Hess	1
Foster	1
Froehlich	1
Lathi	1
Malvino	1
Schwartz	1
Zeines	1

TABLE 3

TEXT PREFERENCES FOR NON-ECPD SAMPLE

TEXT	FREQUENCY
Kennedy	4
Shrader	3
Defrance	2
Froehlich	1
Grob	1
Lathi	1
Malvino	1
Mitchell	1
Simpson & Houts	1

Expectation (1) was thus confirmed by this data in that it had been predicted that the ECPD group would prefer more theoretical books like Kennedy, Zeines, Taub & Schilling and Clarke & Hess. Kennedy was the most frequent choice of this group and the other three, although not appearing frequently, were not mentioned at all by the non-ECPD sample but were all mentioned by the ECPD group.

DeFrance, Mandl, Shrader or Kaufman were predictions for the non-ECPD group and DeFrance and Shrader were two of their top three choices. In addition Shrader did not appear in the ECPD list and Kaufman did not appear in either listing.

Two anomalies did appear. The author would not have expected Mandl to be the second choice of the ECPD group and to not appear at all in the other group. (It had been predicted that Mandl would have been most popular with the non-ECPD group). Secondly, the researcher would not have predicted that Kennedy would be the most popular text (although by a slim margin) in the non-ECPD sample.

Based on the composite data the four most popular books in order of popularity were Kennedy, DeFrance, Shrader and Mandl (tie). Surprisingly enough, in the author's view, this listing also ranks the books from more theoretical to less theoretical.

The responses given to question 2 on the questionnaire are tabulated in Table 4.

TABLE 4

TEACHER'S OPINION OF CURRENT TEXT

	FREQUENCIES		
THE TEXT IS:	ECPD	NON-ECPD	TOTAL
Exceptionally good	1	2	3
Good	6	4	10
Satisfactory	11	5	16
Poor	4	1	5
Unsatisfactory	0	0	0
	N(ECPD)=22	N(NON-ECPD)=12	N=34

This data confirms Expectation (2). It had been predicted that more respondents would say that their text was "satisfactory" or "poor" than would say it was "good" or "exceptionally good". 68% of the ECPD sample, 50% of the non-ECPD sample and 62% of the total group marked their text "satisfactory" or "poor".

Also, as predicted, no one said that their text was "unsatisfactory".

The mode across all groups was "satisfactory".

In analyzing questions 3 and 4, a Pearson Product-Moment Correlation Coefficient (r) was computed (see Appendix H, page 79).

Before computing, the data was checked to ensure that the assumptions underlying the validity of the Pearson - r were met. The data did approximate a linear regression when a scatterplot was made and the data also approximated homoscedasticity ($s = 1.87$ for X and $s = 1.96$ for Y).

With sample size of 21, and thus 19 degrees of freedom, the critical value of r for significance at the .01 level is .549.

The computation resulted in a correlation of .77 between the number of text changes made and the number of years of teaching (i.e. opportunity to change). This was as expected.

In working numerically with the data in questions 3 and 4 the following conventions were adopted:

> In question 3, "5 or more" textbooks was computed as "5".
> In question 4, "0-3" years was computed as "1.5", "4-6" years as "5" and "7 or more" years as "7".

Using these conventions the responses to the questions are tabulated in Table 5.

A complete breakdown of this data is given in Appendix H, page 80.

TABLE 5

SUMMARY OF TEACHER EXPERIENCE AND FREQUENCY OF TEXTBOOK CHANGES

	Number of Respondents	Mean Years of Teaching	Mean Number of Texts Used	Mean Years Per Text
ECPD	21	5.00	3.33	1.50
NON-ECPD	11	3.45	3.00	1.15
TOTAL	32	4.47	3.22	1.39

Thus Expectation (3) is confirmed. It had been predicted that good texts, with which teachers were well satisfied, would not be changed much more often than once in five years. The data shows, however, that the entire group is changing books at the average rate of about one change every one and one third years.

The data for question 5 is tabulated fully in Appendix H, page 81. The results are included here.

When a two-tailed Chi-Square test was conducted to see if the responses of the ECPD group were in agreement with those of the non-ECPD group it was found that there was agreement on <u>all</u> nine questions using an α level of .05 as significant when testing for disagreement.

There were two questions that approached disagreement (and in fact did disagree at an alpha level of .10). These were questions 5A(e): Proper subjects covered; and 5B(b): Is the book technology oriented?

Since there was agreement by both groups on all nine questions, only the composite results are presented in Figures 1 and 2.

Figure 1

Composite Answers to Question 5A
Regarding Textbook Suitability

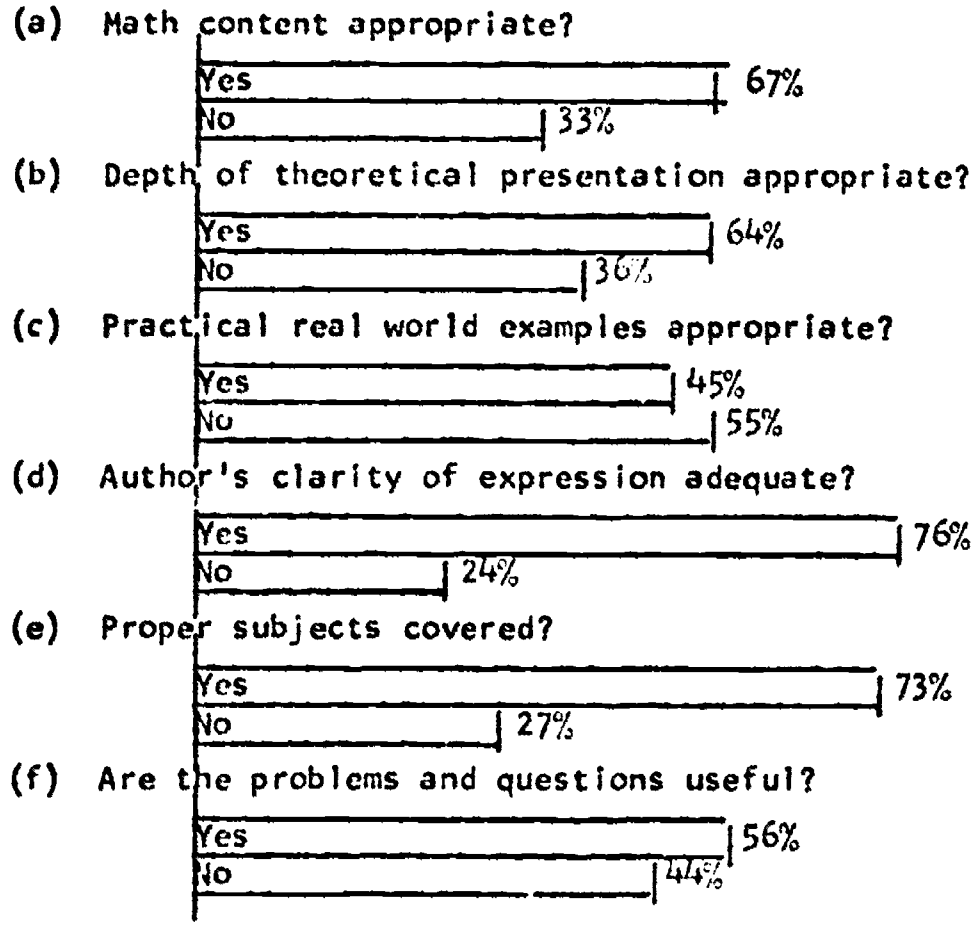
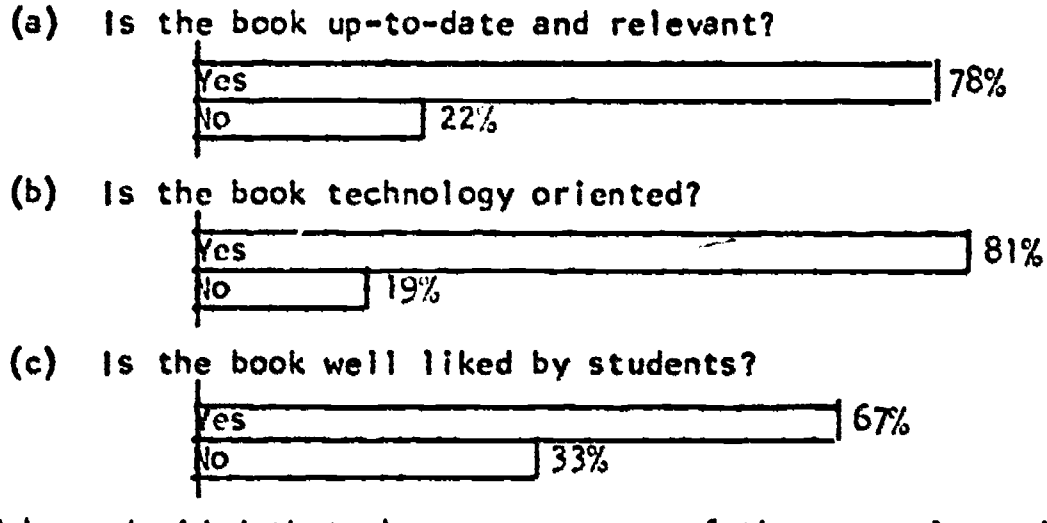


Figure 2

Composite Answers to Question 5B
Regarding Text Characteristics



It had been decided that whenever one out of three people marked "no" to one of these questions that would represent a significant weakness in the current texts. Using this criteria, it can be seen from Figure 1 that in question 5A topics (a), (b), (c) and (f) are areas for concern. From Figure 2, question 5B, topic (c) falls in this category.

Expectation (4) predicted that textbooks would not have encugh real world examples and would not generally be well liked by students. Question 5A(c) dealing with real world examples was the only question here which had more "no's" than "yes's". Question 5B(c) dealing with popularity with students indicated only medium (1 out of 3) dissatisfaction thus Expectation (4) is only partially confirmed.

In the "others" category in question 5A there were eight items listed by eight people. In the "yes" category the three suggestions were: 1) Supplemental information in the text is good (DeFrance), 2) The broad scope of the book is good (Kennedy) and 3) Random signals and noise included (Kennedy). In the "no" category the five suggestions were: 1) Insufficient applications of transistors and IC's in communications (Kennedy), 2) Coverage too broad (Kennedy),

3) No coverage of high frequencies or S-parameters (Kennedy), 4) No coverage of information and coding (Kennedy) and 5) No coverage of data transmission (Kennedy).

In the "others" category in question 5B there were four items listed by two people. In the "yes" category the two suggestions were: 1) Weak in some areas (Kennedy) and 2) Overdone in some areas (Kennedy). In the "no" category the two items were: 1) Not enough on IC's (Kennedy) and 2) Not enough on frequency and time multiplexing (Kennedy).

Interestingly enough, only one item dealt with a book other than Kennedy. Thus, although Kennedy was the most popular book it too is apparently controversial.

There were two comments made on item A and nine comments made on item B. These are included in Appendix G, page 70.

Having completed the analysis of the data concerning textbooks presently being used, we now turn to the data relating to characteristics of a desirable new text.

Question six on the instrument dealt with the general format of such a book. In probing this data, the Chi-Square technique was again used to probe for areas of agreement and disagreement between the two samples. A correlation coefficient could be calculated, as could a Kendall's Coefficient of Concordance but neither of these would give any information beyond an overall measure of agreement. The Chi-Square allows us to do an item by item analysis.

The details of the Chi-Square calculations are included in Appendix H, page 83. It can be seen by studying this appendix that there is complete agreement between the ECPD and the non-ECPD groups (using an alpha level of .05) on all questions except 6d where there

was significant disagreement. Thus the necessity for end of chapter questions was not agreed upon by the two groups.

The responses to this item are summarized in Tables 6 and 7.

TABLE 6

Characteristics of a Desirable New Text
(ECPD Group)

ECPD SAMPLE					
Item	Indispensable	Very Important	Somewhat Important	Not Important	No Opinic
(a) behavioral objectives	4	7	3	6	1
(b) chapter overviews	6	8	4	3	1
(c) summaries & sub-summaries	5	8	6	3	
(d) end of chapter questions	5	11	6	0	
(e) end of chapter problems	15	6	2	0	
(f) end of topic questions	2	6	6	7	
(g) end of topic problems	6	4	9	3	
(h) chapter self-tests	5	4	5	8	
(i) photos & drawings	18	4	1	0	
(j) sections of definitions	9	8	4	0	
(k) chapters built on previous ones	1	7	7	6	2

TABLE 7

Characteristics of a Desirable New Text
(NON-ECPD Group)

NON-ECPD SAMPLE					
Item	Indispensable	Very Important	Somewhat Important	Not Important	No Opini
(a) behavioral objectives	1	6	1	3	
(b) chapter overviews	1	8	1	1	
(c) summaries & sub-summaries	1	7	2	1	
(d) end of chapter questions	5	1	3	2	
(e) end of chapter problems	6	2	3	0	
(f) end of topic questions	1	1	6	2	1
(g) end of topic problems	1	3	3	2	2
(h) chapter self-tests	2	3	4	2	
(i) photos & drawings	8	1	2	0	
(j) sections of definitions	2	7	1	1	
(k) chapters built on previous ones	2	3	4	2	

If categories A and B were combined and compared to the combination of C and D then a two-thirds majority in either direction was considered relevant for that item's inclusion or exclusion from a new text.

Table 8 presents the data in this way. Since there was full agreement on all but one item, only the composite data is presented.

TABLE 8

Composite Data on Desirable Text Characteristics
(Response categories partially combined)

	Indispensable or very Important (A & B)		Somewhat Important or Not Important (C & D)	
Item	Number of Responses	%	Number of Responses	%
(a) behavioral objectives	18	58	13	42
(b) chapter overviews	23	72*	9	28
(c) summaries & sub-summaries	21	64	12	36
(d) end of chapter questions	22	67*	11	33
(e) end of chapter problems	29	85*	5	15
(f) end of topic questions	10	32	21	68*
(g) end of topic problems	14	45	17	55
(h) end of chapter self-tests	14	42	19	58
(i) photos and drawings	31	91*	3	09
(j) sections of definitions	26	81*	6	19
(k) chapters built on previous ones	13	41	19	59

Thus it could be concluded that it would be necessary to include items (b), (d), (e), (i) and (j) in a new text and there would be good reason to exclude item (f). The other items are borderline and it would probably be wise to include them in a complete text.

There were three expectations concerning this question. It was expected that behavioral objectives would be more important to the ECPD sample than to the non-ECPD sample. This proved to be wrong. Fifty-five percent of the ECPD sample rated behavioral objectives as indispensable or very important compared to sixty-four percent for the non-ECPD group.

It was further predicted that problems (both end of chapter and end of topic) would be very important. This was only partially confirmed. End of chapter problems were found to be important by eighty-five percent of the sample while end of topic problems were important to only forty-five percent.

The final expectation was that relevant photographs and drawings would be found to be essential. This was strongly confirmed. A full ninety-one percent of the sample said that these were indispensable or very important.

Eight suggestions were made by eight different people in the "others" area but due to their low frequency, they were not included in the preceding tables. They are listed here, however, along with their ranking:

Indispensable - 1. End of topic solved problems.
2. Some description of existing communications systems, e.g. phone, satellite, medicine and entertainment.
3. Example problems.
4. Book students can refer back to.
5. Discrete chapters.
6. Bibliography.
7. Chapters that stand alone.

Somewhat Important -
1. Cost not excessive.

Two comments were made by the respondents relating to question six. They are listed in Appendix G, page 71.

In studying the results of question 7 it was obvious that a detailed analysis could not be performed since there were 117 items. Thus for the first tabular presentation (Table 9), categories A and B ("Essential" and "Very Important") were combined and categories C and D ("Somewhat Important" and "Should Just be Mentioned") were also combined. Category E ("Should Be Left Out") was kept intact and category F ("No Opinion") was omitted.

The complete data tabulation for this question is presented in Appendix H, page 85 . The frequencies do not always add up to the

sample size since some respondents did not check all items. Percentages may add up to 99% or 101% due to round off error in the computations.

As detailed in Appendix H, page 87 , the Student's t statistic was used to probe Table 9 for areas of agreement or disagreement between the ECPD and non-ECPD groups.

Asterisks are placed in those columns in Table 9 where disagreement exists at the .01 alpha level. Only 18 of the 117 items indicated significant disagreement. Interestingly, if the last column is omitted ("Should Be Left Out") then there is disagreement at the .01 alpha level on only three of the items (46, 84 and 85). Although no expectation was advanced on question 7, nevertheless the author would never have expected agreement on 99 out of the 117 items. A number sign (#) by the item numbers mark those questions which had two (#), three (##) or seven (###) "no opinions" marked. All other questions had no more than one "no opinion".

TABLE 9

Question 7 Data Concerning Topic Preferences

		Do ECPD & Non-ECPD Agree or Disagree?	Essential or Very Important		Somewhat Important or Just Mention		Should be Left Out	
	Item	(at the .01 level)	ECPD%	Non-ECPD%	ECPD%	Non-ECPD%	ECPD%	Non-ECPD%
	1	A	74	64	21	27	5	9
	2	A	68	73	26	18	5	9
	3	A	74	64	21	27	5	9
	4	A	50	64	35	27	15	9
	5	A	25	36	45	55	30	9
	6	A	20	45	50	45	30	9
	7	A	68	82	32	18	0	0
	8	A	89	82	11	18	0	0
	9	A	60	82	35	18	5	0
	10	A	42	45	53	45	5	9
	11	A	40	45	45	45	15	9
	12	A	68	82	21	9	11	9
	13	A	70	73	30	27	0	0
	14	A	86	91	14	9	0	0
#	15	A	44	45	50	45	6	9
	16	A	30	36	60	55	10	9
	17	A	25	55	65	36	10	9

TABLE 9 (continued)

	Item	Do ECPD & Non-ECPD Agree or Disagree? (at the .01 level)	Essential or Very Important			Somewhat Important or Just Mention			Should be Left Out		
			ECPD%		Non-ECPD%	ECPD%		Non-ECPD%	ECPD%		Non-ECPD%
	18	A	55		55	35		27	10		18
	19	A	60		73	30		27	10		0
	20	A	57		45	29		45	14		9
	21	A	55		36	40		64	5		0
	22	A	40		50	55		42	5		8
	23	A	45		64	45		36	10		0
	24	A	48		73	43		18	9		9
	25	D	24		18	48		82	29	*	0
	26	A	70		91	20		9	10		0
	27	A	79		91	16		9	5		0
	28	A	78		73	17		27	5		0
	29	A	100		91	0		9	0		0
	30	A	84		82	16		18	0		0
	31	A	84		82	16		18	0		0
	32	A	84		64	16		36	0		0
	33	A	37		40	53		50	11		10
	34	A	37		18	53		73	11		9
	35	A	63		64	37		36	0		0
##	36	A	21		22	68		67	11		11
	37	A	32		20	58		80	11		0
	38	A	89		73	11		27	0		0
	39	A	79		82	21		18	0		0
	40	A	58		82	42		18	0		0
	41	A	100		100	0		0	0		0
	42	A	83		91	17		9	0		0
	43	A	84		91	16		9	0		0
	44	A	95		100	5		0	0		0
	45	A	74		50	26		50	0		0
###	46	D	59	*	14	41	*	86	0		0
	47	A	79		73	16		27	5		0
	48	A	53		45	32		45	16		11
	49	A	47		45	37		45	16		11
	50	A	47		55	37		36	16		11
	51	A	42		64	47		27	11		11
#	52	A	61		64	17		27	22		11
	53	A	63		64	11		27	26		11
	54	A	47		36	26		45	26		18
	55	A	21		45	32		45	47		11
	56	A	20		45	35		45	45		11
	57	A	25		45	30		45	45		11
	58	A	30		55	25		36	45		9
	59	A	25		50	30		40	45		10
	60	A	30		55	20		36	50		9
	61	D	30		60	45		40	25	*	0
	62	D	25		40	50		60	25	*	0
	63	A	32		70	47		30	21		0
	64	A	26		50	53		50	21		0
	65	A	47		70	32		30	21		0
	66	A	37		60	42		40	21		0
	67	A	16		40	68		60	16		0
##	68	A	17		40	67		60	17		0

TABLE 9 (continued)

	Item	Do ECPD & Non-ECPD Agree or Disagree? (at the .01 level)	Essential or Very Important		Somewhat Important or Just Mention		Should be Left Out		
			ECPD%	Non-ECPD%	ECPD%	Non-ECPD%	ECPD%		Non-ECPD%
	69	D	19	20	57	80	24	*	0
	70	D	15	27	55	73	30	*	0
	71	D	11	30	53	70	37	*	0
	72	D	11	30	58	70	32	*	0
	73	D	25	30	45	70	30	*	0
	74	A	10	20	70	80	20		0
	75	A	30	20	55	80	15		0
	76	D	25	27	50	73	25	*	0
##	77	A	06	0	56	90	39		10
	78	A	21	45	68	45	11		10
	79	A	33	36	50	55	17		09
	80	A	32	45	58	45	11		10
	81	D	16	55	42	45	42	*	0
	82	A	74	50	26	50	0		0
	83	A	68	55	21	45	11		0
	84	D	05	09	32 *	91	63	*	0
	85	D	0	09	28 *	91	72	*	0
	86	D	11	18	42	82	47	*	0
	87	D	05	18	68	82	26	*	0
##	88	A	11	10	72	90	17		0
	89	A	68	55	32	45	0		0
	90	A	55	36	30	55	15		09
	91	A	45	73	45	27	10		0
	92	A	65	82	30	18	05		0
	93	A	74	73	26	27	0		0
#	94	A	67	55	33	45	0		0
	95	A	68	73	26	18	05		09
#	96	A	39	27	44	64	17		09
#	97	A	39	36	44	64	17		0
	98	A	30	18	55	82	15		0
##	99	A	41	45	59	55	0		0
	100	A	53	64	42	36	05		0
	101	A	47	55	47	45	05		0
	102	A	25	27	55	64	20		09
	103	D	16	36	37	64	47	*	0
	104	A	79	45	21	55	0		0
	105	A	63	64	21	36	16		0
	106	A	53	64	26	36	21		0
##	107	D	12	27	65	73	24	*	0
#	108	A	72	64	17	36	11		0
#	109	A	42	45	42	45	16		10
	110	A	44	30	39	60	17		10
##	111	A	24	27	71	73	06		0
##	112	D	11	20	56	80	33	*	0
	113	A	26	30	47	60	26		10
	114	A	16	30	58	50	26		20
##	115	A	11	20	67	70	22		10
	116	A	11	20	58	70	32		10
	117	A	21	40	68	60	11		0

In order to be of value in constructing a new textbook, the data needed to be tabulated in a different way as has been done in Tables 10 and 11. Table 10 presents the data in order from most agreement to least agreement. Table 11 presents it from most disagreement to least disagreement.

TABLE 10

Areas of Agreement in the Sample
Concerning Desirable Text Topics

Essential Topics	
Item	Topic
41	FM Theory
44	FM Block Diagram
29	AM Theory
14	Detector Circuits
43	FM receiver circuits
42	FM transmitter circuits
8	Balanced Modulators
27	Circuits built around FET's
30	AM transmitter circuits
31	AM receiver circuits
28	SSB principles
39	SSB Block
26	Circuits built around bipolar transistors
47	Phase Modulation concepts
28	Circuits built around IC's
12	Impedance Matching
7	Frequency Multipliers and Dividers
32	Superheterodyne Block Diagram
92	Noise Problems
93	Pulse Modulation (PCM,PPM,PWN)
13	Tuned Amplifiers
9	Low, High, Pass, Reject Filters
2	RF and Audio Amps
95	Frequency and Time Division Multiplexing
40	SSB Circuits
1	Oscillators
3	Coupling Methods
108	Frequency Domain Presentations
19	Amplifier Frequency Characteristics
35	Superhet circuits
53	Transmission Line Applications
105	Power amps
52	Transmission Line Principles
45	Stereo FM principles
104	Need for modulation
82	Communications IC Circuits
83	Overview of a typical complete comm. system
89	The Radio Frequency Spectrum
94	Pulse Modulation Circuits

TABLE 10 (continued)

Essential Topics	
Item	Topic
24	Wideband Amplifiers
91	Distortion
65	B/W TV Theory
100	Spectrum Analysis
106	Voltage amps
4	Classes of Amplifiers
18	Operational Amplifiers
23	Varactor Circuits
51	Propagation of Radio Waves
20	Decibels
50	Antenna Characteristics
63	Color TV Block
101	Data transmissions
48	Antenna Theory
66	Color TV Theory
49	Antenna Types
90	Fourier Analysis
109	Space communications
58	Microwave Measurements
60	Radar Fundamentals
54	Smith Chart
59	Microwave Antennas

Topics to be Treated Briefly	
Item	Topic
88	Direct Conversion Receivers
74	Telephone equipment and principles
77	Audio Visual Equipment
111	Radio controlled devices
37	Regenerative circuits
98	Crystals (Piezoelectric Theory)
115	Remote Sensing
75	Broadcast station overview
36	TRF Circuits
116	Electronic Security Systems
117	Laser communications
67	CATV Concepts
68	CCTV Concepts
34	Regenerative & Super regenerative Blocks
102	Transducers
16	Pads and Attenuators
99	CW Principles
78	General Alignment Procedures
97	Telemetry Principles
114	Sonar
96	A/D Conversion
113	Radar
79	General Troubleshooting Techniques
21	Crystal Mechanical, Ceramic Filters
33	TRF Block
64	Color TV Circuits

TABLE 10 (continued)

Topics to be Treated Briefly	
Item	Topic
80	Operational Checks (e.g. trapezoidal mod. check)
17	Cascading Amplifiers
5	Power Supplies
110	Medical Monitoring
10	Buffers
22	Frequency Synthesis
6	Filtering and Regulation
15	Equalizers
11	Push-Pull Amplifiers
109	Space Communications
56	Microwave tubes and devices
55	Microwave Fundamentals
57	Waveguides and resonators

TABLE 11

Areas of Disagreement in the Sample Concerning Desirable Text Topics

Essential Topics			
ECPD Group		Non-ECPD Group	
Item	Topic	Item	Topic
46	SCA System	61	B/W TV Block
		81	FCC Questions & Answers
Topics to be Treated Briefly			
ECPD Group		Non-ECPD Group	
Item	Topic	Item	Topic
87	Radio Aids to Navigation	84	Amateur Radio
107	Facsimile	85	Citizens Band Radio
72	Magnetic Recording-Video	25	Circuits built around tubes
69	Speakers and headsets	86	Radio telegraph principles
112	Military communications equipment	87	Radio Aids to Navigation
		69	Speakers and headsets
70	Microphones	112	Military communications equipment
71	Magnetic Recording-Audio		
62	B/W TV Circuits	107	Facsimile
76	Audio Mixers and Bridging	76	Audio Mixers and Bridging
25	Circuits built around tubes	70	Microphones
		71	Magnetic Recording-Audio
73	Stereo Systems and Components .	72	Magnetic Recording-Video
		73	Stereo Systems and Components
		103	FCC Rules and Regulations
		62	B/W TV Circuits

TABLE 11 (continued)

Topics to be Left Out			
	ECPD Group	Non-ECPD Group	
Item	Topic	Item	Topic
85	Citizens Band Radio		
84	Amateur Radio		
86	Radio Telegraph Principles		
103	FCC Rules & Regulations		

Within the ECPD group, there were eight suggestions in the "others" area on question 7 made by five people. They are listed here by categories.

Essential - 1) FM Repeaters
2) Error Determination
3) Circuit Margin Calculations
4) Basic Information Theory
5) "S" Parameters

Very Important -
1) Satellite Communications
2) Striplines

Somewhat Important -
1) Error Correcting & Coding

In the non-ECPD group there was only one suggestion in the "others" column.

Essential - 1) FCC Rules & Regulations

Fifteen comments were received concerning item 7. They are listed in Appendix G, page 72.

Question 8 dealt with the nature of the treatment in a desirable new text. The complete data collected on the question is in Appendix H, page 89.

In presenting the results of this data below in Table 12, the "no opinion" column (column E) was omitted since only 2% of the responses fell in this category. In addition, categories A and B ("Essential" and "Very Important") and categories C and D ("Somewhat Important" and "Not Important") were combined.

TABLE 12

Responses of Both Groups to Item 8
(Percentages)

Item	ECPD Group		Non-ECPD Group	
	Essential or Very Important	Somewhat Important or Not Important	Essential or Very Important	Somewhat Important or Not Important
(a)	52%	48%	55%	45%
(b)*	81	19	100	0
(c)	85	15	80	20
(d)	40	60	64	36
(e)	81	19	70	30
(f)	30	70	36	64
(g)*	52	48	91	9
(h)	60	40	80	20

There was disagreement (see Appendix H) between these two groups at the .05 alpha level on items (b) and (g). That is theoretical explanations were deemed more important by the non-ECPD group than by the ECPD group and the groups also disagreed upon the value of laboratory oriented treatments.

Five expectations were advanced regarding the responses to this item. It had been predicted that mathematical proofs and derivations and theoretical explanations would be more important to the ECPD group but not very important to either group. This expectation proved to be wrong on both counts. A majority of each group did feel proofs, derivations and theoretical explanations were important and the non-ECPD group felt even more strongly than the ECPD sample. It was also predicted that survey treatments of most topics would be felt to be essential by both groups. This expectation held true for the non-ECPD group with 64% feeling this way. The ECPD group split 40-60 but this apparent disagreement with the non-ECPD group was not statistically significant. The necessity to stress underlying principles was agreed upon and deemed important by both groups as

had been expected. The author was completely fooled on the importance of coverage of industrial devices and applications. This was predicted to be very important to both groups. Although both groups completely agreed on this item, only about one-third of the sample felt coverage of this type to be important. Finally, it was predicted that laboratory verification of key concepts would be very important to all in the sample. There was significant disagreement on this item. The non-ECPD group strongly supported the lab orientation (91% felt it to be essential or very important) but the ECPD group felt it to be a lot less important (although a majority of even this group felt it essential or very important).

Table 13 presents the results in a more usable way for textbook planners. The responses are ranked with those topics deemed most important being at the top of the table.

TABLE 13

Composite Ranking of Items in Question 8

Essential Treatment	
Item	Treatment
(b)	Theoretical explanations
(c)	Analysis of typical representative circuits
(e)	Underlying electrical fundamentals stressed
(g)	Treatment should be laboratory oriented and all key ideas verified in lab.
(h)	Newest devices should get complete coverage.
	Borderline for Inclusion
Item	Treatment
(a)	Mathematical proofs and derivations
(d)	Survey treatment of all but the most important topics
	Not Important for Inclusion
Item	Treatment
(f)	Coverage of specific industrial devices and applications

Five suggestions were made in the "others" category in question 8 (each with a frequency of one). They were as follows:

Essential - 1) Underlying system functions stressed
2) Derive math model
3) Design techniques

Very Important -
1) Stay with general procedures

Not Important -
1) Rigorous math, EE oriented

Four comments were received concerning question 8. They are listed in Appendix G, page 74.

Question 9 on the instrument gave the respondents an opportunity to express their general opinion of the questionnaire. The researcher was gratified to see that no negative opinions were recorded by the respondents concerning their overall impression of the instrument. Table 14 summarizes their responses to item 9. Both groups completely agreed on this item.

TABLE 14

Responses of Both Groups to Item 9

Do you feel this questionnaire provided adequate means for you to express your opinion on communications texts?:	ECPD %	NON-ECPD %	TOTAL %
Yes, completely	25%	27%	26%
No, not at all	0	0	0
In most areas	75	73	76
In few areas	0	0	0

In question 10 the respondents were given an opportunity to make any comments at all concerning the instrument, textbooks or communications in general. Twenty-three comments were received and only one of them was really negative. They are reproduced in Appendix G, page 75.

No comments were received in the space provided on the bottom half of page 7 in the questionnaire.

SUMMARY AND CONCLUSIONS

This study attempted to point out weaknesses of current textbooks in electronic communications if such weaknesses existed in the opinion of the respondents.

The author had expectations concerning the responses that would be received from the sample of fifty from the population of electronics communications teachers in A.A.S. programs concerning textbooks and these expectations were tested in the study. The author was interested in how teachers in ECPD accredited programs would compare in their attitudes with those in non-ECPD programs.

In addition to soliciting opinions on the adequacy of current texts, a major portion of the study dealt with desirable characteristics of a new text, should one be needed.

The study had seven major objectives. Each objective is listed below along with the significant findings in abbreviated form.

OBJECTIVE 1 - What textbooks are currently being used in electronic communications courses at the technology level?

Expectations: It was expected that the ECPD group would prefer more theoretical texts than the non-ECPD group.

Findings: The expectation was confirmed. The ECPD group most preferred Kennedy, Mandl, DeFrance and Taub & Schilling while the non-ECPD sample most preferred Kennedy, Shrader and DeFrance. The composite data indicated that the top three choices of texts by the overall sample were Kennedy, DeFrance, Shrader and Mandl (tie).

OBJECTIVE 2 - Do the majority of respondents feel satisfied with the text they are using?

Expectations: It was expected that more respondents would say their book is satisfactory or poor than would say it is good or exceptionally good. It was further expected that no one would say their test is unsatisfactory.

Findings: The expectations were confirmed. More of the ECPD sample (68%) than the non-ECPD sample (50%) were dissatisfied and only 9% felt their text was exceptionally good. No one said their text was unsatisfactory.

OBJECTIVE 3 - How often are communications textbooks typically changed?

Expectations: It was predicted that if texts are inadequate they will be changed much more often than once in five years.

Findings: The expectation was confirmed. The ECPD sample changed texts an average of once every 1.5 years while the non-ECPD sample changed once every 1.15 years. The overall sample changed at an average rate of once every 1.39 years.

OBJECTIVE 4 - Given a list of alternatives, can teachers select strengths and weaknesses of the textbook that they are currently using? Will there be agreement on the strengths and weaknesses?

Expectations: It had been expected that lack of sufficient real world examples would be a weakness as would the popularity of the texts with students.

Findings: There was complete agreement (at the .05 alpha level) between the two groups on this item. The expectations were only partially confirmed. The majority (55%) felt that real world examples were not sufficient but only 33% of the students, according to their instructor's observation, were dissatisfied with their books.

Current textbooks are weak in the appropriateness of their math content, the depth of their theoretical presentation, the usefulness of their real world examples, the usefulness of problems and questions and the popularity of the book with its users according to the responses received.

Strengths reported were the relevant and up-to-date books, the author's clarity of expression, the appropriateness of subject selection and the technology orientation of currently available books.

OBJECTIVE 5 - How will teachers rate the desirability of behavioral objectives, chapter overviews, summaries and sub-summaries, end of chapter and end of topic questions, end of chapter and end of topic problems, self tests, photographs and drawings, sections of definitions and unification of topics into an overall plan in desired textbook format?

Expectations: It was predicted that the ECPD sample would find behavioral objectives more necessary than the non-ECPD group. It was predicted that end of chapter and end of topic problems would be

very important. It was predicted that relevant photographs and drawings would be essential.

Findings: The first expectation was denied in that 55% of the ECPD group compared to 64% of the non-ECPD group found behavioral objectives to be very important. The second expectation was only partly confirmed. End of chapter problems were deemed very important by 85% of the sample but end of topic problems were important to only 45%. The third expectation was strongly supported in that 91% of the sample felt that relevant photographs or drawings were essential.

In addition, the respondents agreed that chapter overviews, end of chapter questions, end of chapter problems, photos and drawings and sections of definitions were necessary in a good textbook. End of topic questions were not deemed important for inclusion and the other items were of marginal value in a text.

OBJECTIVE 6 - Given a list of possible topics to be covered in a survey communications course, will the respondents agree on those topics that are most important and least important? Will the ECPD group come to the same conclusions as the non-ECPD group?

Expectations: None

Findings: There was agreement between the two groups on 99 of the 117 items. Tables 9, 10 and 11 in this report present the complete findings but those topics

which both groups felt were essential for inclusion into a desirable text are reproduced below in Table 15 in order of importance (from most to least):

TABLE 15

Areas of Agreement Concerning
Desirable Text Topics

Essential Topics	
Item	Topic
41	FM Theory
44	FM Block Diagram
29	AM Theory
14	Detector Circuits
43	FM receiver circuits
42	FM transmitter circuits
8	Balanced Modulators
27	Circuits built around FET's
30	AM transmitter circuits
31	AM receiver circuits
38	SSB principles
26	Circuits built around bipolar transistors
47	Phase Modulation concepts
28	Circuits built around IC's
12	Impedance Matching
7	Frequency Multipliers and Dividers
32	Superheterodyne Block Diagram
92	Noise Problems
93	Pulse Modulation (PCM,PPM,PWN)
13	Tuned Amplifiers
9	Low, High, Pass, Reject Filters
2	RF and Audio Amps
95	Frequency and Time Division Multiplexing
40	SSB Circuits
1	Oscillators
3	Coupling Methods
108	Frequency Domain Presentations
19	Amplifier Frequency Characteristics
35	Superhet circuits
53	Transmission Line Applications
105	Power amps
52	Transmission Line Principles
45	Stereo FM principles
104	Need for modulation
82	Communications IC Circuits
83	Overview of a typical complete comm. system
89	The Radio Frequency Spectrum
94	Pulse Modulation Circuits
24	Wideband Amplifiers
91	Distortion

TABLE 15 (continued)

Essential Topics	
Item	Topic
65	B/W TV Theory
100	Spectrum Analysis
106	Voltage amps
4	Classes of Amplifiers
18	Operational Amplifiers
23	Varactor Circuits
51	Propagation of Radio Waves
20	Decibels
50	Antenna Characteristics
63	Color TV Block
101	Data transmissions
48	Antenna Theory
66	Color TV Theory
49	Antenna Types
90	Fourier Analysis
109	Space communications
58	Microwave Measurements
60	Radar Fundamentals
54	Smith Chart
59	Microwave Antennas

OBJECTIVE 7 - How important are each of the following in a desirable text?

a. Mathematical proofs and derivations
b. Analysis of typical circuits
c. Survey treatment of most topics
d. Underlying principles stressed
e. Coverage of specific industrial devices and applications
f. Laboratory verification of key ideas
g. Coverage of newest devices

Expectations: It was expected that mathematical proofs and derivations would be more important to the ECPD group but not very important to either group.

It was also expected that survey treatments would be sufficient in most areas.

Underlying principles were expected to be very important and coverage

of industrial devices and applications was expected to be very important.

Laboratory verification was predicted to be very important.

Findings: Mathematical proofs and derivations were important to both groups with the non-ECPD group finding them slightly more important than the ECPD group (55% to 52%). The groups agreed on the importance of survey treatments and also on the importance of stressing underlying principles.

The group did not respond as expected concerning the importance of coverage of industrial devices and applications. Only about one third felt this was important. Both groups felt that laboratory verification was important with a full 91% of the non-ECPD group feeling strongly about this compared to 52% of the ECPD group.

Both groups agreed that the items in Table 16 below were <u>essential</u> in any new textbook (in order of preference):

TABLE 16

Areas of Agreement Concerning
Desirable Textbook Treatments

Essential Treatment	
Item	Treatment
(b)	Theoretical explanations
(c)	Analysis of typical representative circuits
(e)	Underlying electrical fundamentals stressed
(g)	Treatment should be laboratory oriented and all key ideas verified in lab
(h)	Newest devices should get complete coverage

When asked if the questionnaire provided adequate means for the respondents to express their views, all of the respondents said that it did either completely or in most areas. This was very gratifying to the researcher.

Twenty-Three excellent comments were recorded and have been documented in Appendix G.

The findings of this study have been very enlightening to the author and it is hoped that they will prove valuable to others as well.

RECOMMENDATIONS FOR FURTHER STUDY

It is recognized by the author that this was a very narrowly restricted study dealing with an area in which there may not be wide interest. It is assumed, however, that this type of study could be conducted profitably by prospective authors in many fields. Certainly textbooks based upon peer concensus would be more useful and more widely accepted than those which are the result of one person's thoughts. Too often books are produced which are just not in the mainstream of thought and practice in a given area and thus rapidly fall into disuse.

It would be far more profitable if student instead of (or in addition to) peer viewpoints could be considered. The student of course is the ultimate user of the textbook and very few books are written at his level. Since students usually only see one communications book they may not have the exposure to be very critical of the field but if they could be surveyed it would be very profitable.

This study could be extended in many directions. It would be interesting to know if the desired format, depth and structure of communications books are the same as electronics books in general. That is, for example, are photos and drawings, industrial devices and coverage of new devices as important in other areas of electronics as well? Where there were areas of disagreement on format and structure would they exist if other kinds of electronic books were considered or are they unique to communications?

It would be valuable to know what the differences are between the ECPD group and the non-ECPD group. How do they differ in terms of industrial experience, teaching experience, education or philosophy. Why did all of the ECPD group and only 60% of the non-ECPD group respond?

How would the views of the non-respondents have altered the results of the study? What reasons would they give for not responding?

It would also be useful to know the attitudes of the non-ECPD group toward the importance of accreditation.

The study indicated that the lifetime of all books currently being used averages a little over a year. What would be the useful lifetime of those few books which were rated exceptionally good? Would this modify the author's assumption that a good book would be used five years?

Among the many ways to address a form letter, what may most assures that the letter gets into the right hands and will be responded to?

Of course all expectations in the study which proved to be wrong could be the subject of more intensive investigation.

It would be an interesting follow-up to identify those few books which were rated as exceptionally good to see if they in fact have those characteristics which the respondents said were essential. If they do not, this apparent inconsistency would need to be further probed.

Finally, it would be very useful to future authors if after the proposed new book is written it were evaluated by these same respondents to see if it met their needs. Would any group of teachers even agree that a book was or was not adequate in a given area? Do teachers really choose books in practice based upon the kinds of desires expressed to this researcher?

It was observed that the non-ECPD group had a much stronger orientation toward the FCC exam and its importance. Why does the ECPD group not feel this way (as evidenced by their responses to

this study)? How important is it to train students with the FCC license in mind?

These are a few of the questions that could be asked and studied further. So little research has been done in some of these areas that they certainly could be fruitfully explored.

BIBLIOGRAPHY

1. Bas, Radha C. An Analytical Study of Electrical Curricula in Selected Technical Institutes of NE United States. Ph.D. Thesis. Cornell University, 1950.

2. Bekton, William E. Design Instruction in Industrial Arts Teacher Education: A Curriculum Analysis with Opinions of Educators Regarding Content and Instructional Practices. Ed.D. Thesis. (Institution Unknown), 1965.

3. Downie, N.M. and Heath, R.W. Basic Statistical Methods. (3rd ed.) New York: Harper and Row, 1970.

4. Engineer's Council for Professional Development. List of Accredited Curricula Leading to Degrees in Engineering Technology, 1972. New York: 1973.

5. Froelich, Donald M. A Comparison of Two Methods of Assessing Textbook Readability of Selected College Level Electronics Textbooks. Ed.D. Thesis. University of Missouri, 1970.

6. Gillie, Angelo C. A Study to Determine A Common Core of the Curriculum for Community College Electronic Technology Programs. Ed.D. Thesis. State University of New York at Buffalo, 1967.

7. Gleazer, Edmund J., Jr. (ED.) American Junior Colleges. Eighth Edition. Washington D.C.: American Council on Education, 1971.

8. Kish, Leslie Survey Sampling. New York: J. Wiley, 1965.

9. McCain, Jerry C. Textbook Suitability for the Industrial Arts Program in Texas. Ed.D. Thesis. North Texas State College, 1959.

10. Mills, Boyd C. Identification of Major Knowledge Clusters Involved in Performance of Electronic Technician Work. Ed.D. Thesis. Washington State University, 1967.

11. Oppenheim, Abraham N. Questionnaire Design and Attitude Measurements. New York: Basic Books, 1966.

12. Pankowski, Dallas J. An Analytical Study of the Content of Four Selected Electrical-Electronics Courses With Recommendations by Electrical Specialists. Ed.D. Thesis. University of Missouri, 1966.

13. Schweinfurth, Ludwig. Development of a Model Program in Engineering Graphics Based Upon Behavioral Objectives Evaluated by Authorities in the Field. Ph.D. Thesis. Texas A&M University, 1969.

APPENDICES

APPENDIX A

ECPD ACCREDITED SAMPLE

Bradley
Brigham Young
Cincinnati (Ohio College of Applied Science)
Cogswell Poly-Tech
CREI
De Vry (Chicago)
Grossmont College
Hartford State Technical College
Holding Technical Institute
Houston, University of
Lowell Institute of Technology
Memphis State University
Michigan Technical University
Milwaukee School of Engineering
Mohawk Valley Community College
New Mexico State University
Northrop Institute of Technology
Oklahoma State
Old Dominion University
Phoenix College
Ricks College
Southern Technical Institute
Spring Garden College
Weber State
Wentworth Institute

APPENDIX B

NON-ECPD ACCREDITED SAMPLE

Central State University*
Eastern Kentucky University
Elmira College
Ferris State*
Kentucky State*
Kent State (Trumball)*
Langston University
Lawrence Institute of Technology
Metropolitan State
Nebraska, University of*
Nevada, University of (Las Vegas)
New Mexico Highlands
Norfolk State*
North Carolina Agricultural and Technical University
Northern Montana College
Pacific Union*
Point Park College
Rochester Institute of Technology
St. Cloud State College
SUNY at Buffalo*
Southeastern State College
Southwestern Minnesota State College*
Virginia Commonwealth*
Walla Walla College
Western Kentucky

*Non-respondents

APPENDIX C

QUESTIONNAIRE

PART I

Present Text:

1. What textbook are you currently using in your electronics communications course?

   Title: _____

   Author: _____

2. What is your opinion of this text in terms of how well it meets both student and teacher requirements? (check one)

   A. The text is exceptionally good _____
   B. The text is good _____
   C. The text is satisfactory _____
   D. The text is poor _____
   E. The text is unsatisfactory _____

3. How many textbooks have you used in communications since you began teaching the subject? (check one)

   A. 1 _____
   B. 2 _____
   C. 3 _____
   D. 4 _____
   E. 5 or more _____

4. How many years have you been teaching communications? (check one)

   A. 0 - 3 _____
   B. 4 - 6 _____
   C. 7 or more _____

NOTE: If additional space is required to answer or add to any of the following questions, please use the space provided on page 7.

5. Several characteristics are given below which may apply to the text you are now using. Circle an opinion for each characteristic.

   A. Is the text appropriate for your students in terms of:

(a)	Mathematical content of the book	yes	no
(b)	Depth of theoretical presentation	yes	no
(c)	Practical "real world" examples	yes	no
(d)	Author's clarity of expression	yes	no
(e)	Proper subjects covered	yes	no
(f)	Usefulness of problems and questions	yes	no
Others (specify):			
(g)		yes	no
(h)		yes	no
(i)		yes	no

Comments on item A:

B. Is the book:

(a) Up-to-date and relevant	yes	no
(b) Technology oriented	yes	no
(c) Well liked by the students	yes	no

Others (specify):

(d)	yes	no
(e)	yes	no
(f)	yes	no

Comments on item B:

PART II

Characteristics of a Desirable Text:

6. Indicate below how important each of these items would be for inclusion into a desirable textbook: (circle one)

Key: A = Indispensable
B = Very Important
C = Somewhat Important
D = Not Important
E = No Opinion

(a)	Behavioral objectives at the beginning of each chapter.	A	B	C	D	E
(b)	Chapter overviews or introductions.	A	B	C	D	E
(c)	Summaries and sub-summaries.	A	B	C	D	E
(d)	End of chapter questions.	A	B	C	D	E
(e)	End of chapter problems.	A	B	C	D	E
(f)	End of topic questions.	A	B	C	D	E
(g)	End of topic problems.	A	B	C	D	E
(h)	End of chapter self-tests.	A	B	C	D	E
(i)	Relevant photographs or drawings.	A	B	C	D	E
(j)	Sections of definitions as necessary.	A	B	C	D	E
(k)	Chapters that are built on previous ones instead of chapters that stand alone.	A	B	C	D	E

Others (specify):

(l)	A	B	C	D	E
(m)	A	B	C	D	E
(n)	A	B	C	D	E
(o)	A	B	C	D	E
(p)	A	B	C	D	E

Comments on the previous section:

7. Consider the following topics and decide how important they are for inclusion into a desirable communications textbook which would meet your needs and those of your students. (circle one)

Key: A = Essential (In depth coverage required)
B = Very Important (Good coverage necessary)
C = Somewhat Important
D = Should just be mentioned
E = Should be left out
F = No Opinion

Note: Assume that basic 1st year electrical and electronics topics have already been covered in other courses. Obviously many of these topics are very general. Please mark them on the basis of your understanding of what is meant by each topic.

1.	Oscillators	A	B	C	D	E	F
2.	RF and Audio Amps	A	B	C	D	E	F
3.	Coupling Methods	A	B	C	D	E	F
4.	Classes of Amplifiers	A	B	C	D	E	F
5.	Power Supplies	A	B	C	D	E	F
6.	Filtering and Regulation	A	B	C	D	E	F
7.	Frequency Multipliers & Dividers	A	B	C	D	E	F
8.	Balanced Modulators	A	B	C	D	E	F
9.	Low, High, Pass, Reject Filters	A	B	C	D	E	F
10.	Buffers	A	B	C	D	E	F
11.	Push-Pull Amplifiers	A	B	C	D	E	F
12.	Impedance Matching	A	B	C	D	E	F
13.	Tuned Amplifiers	A	B	C	D	E	F
14.	Detector Circuits	A	B	C	D	E	F
15.	Equalizers	A	B	C	D	E	F
16.	Pads and Attenuators	A	B	C	D	E	F
17.	Cascading Amplifiers	A	B	C	D	E	F
18.	Operational Amplifiers	A	B	C	D	E	F
19.	Amplifier Frequency Characteristics	A	B	C	D	E	F
20.	Decibels	A	B	C	D	E	F
21.	Crystal, Mechanical, Ceramic Filters	A	B	C	D	E	F
22.	Frequency Synthesis	A	B	C	D	E	F
23.	Varactor Circuits	A	B	C	D	E	F
24.	Wideband Amplifiers	A	B	C	D	E	F
25.	Circuits built around tubes	A	B	C	D	E	F
26.	Circuits built around bipolar transistors	A	B	C	D	E	F
27.	Circuits built around FET's	A	B	C	D	E	F
28.	Circuits built around IC's	A	B	C	D	E	F
29.	AM theory	A	B	C	D	E	F
30.	AM transmitter circuits	A	B	C	D	E	F
31.	AM receiver circuits	A	B	C	D	E	F
32.	Superheterodyne Block Diagram	A	B	C	D	E	F
33.	TRF Block	A	B	C	D	E	F
34.	Regenerative & Super regenerative Blocks	A	B	C	D	E	F
35.	Superhet circuits	A	B	C	D	E	F

36.	TRF Circuits	A	B	C	D	E	F
37.	Regenerative circuits	A	B	C	D	E	F
38.	SSB principles	A	B	C	D	E	F
39.	SSB Block	A	B	C	D	E	F
40.	SSB Circuits	A	B	C	D	E	F
41.	FM Theory	A	B	C	D	E	F
42.	FM transmitter circuits	A	B	C	D	E	F
43.	FM receiver circuits	A	B	C	D	E	F
44.	FM Block Diagram	A	B	C	D	E	F
45.	Stereo FM principles	A	B	C	D	E	F
46.	SCA System	A	B	C	D	E	F
47.	Phase Modulation concepts	A	B	C	D	E	F
48.	Antenna Theory	A	B	C	D	E	F
49.	Antenna Types	A	B	C	D	E	F
50.	Antenna Characteristics	A	B	C	D	E	F
51.	Propagation of Radio Waves	A	B	C	D	E	F
52.	Transmission Line Principles	A	B	C	D	E	F
53.	Transmission Line Applications	A	B	C	D	E	F
54.	Smith Chart	A	B	C	D	E	F
55.	Microwave Fundamentals	A	B	C	D	E	F
56.	Microwave tubes and devices	A	B	C	D	E	F
57.	Waveguides and resonators	A	B	C	D	E	F
58.	Microwave Measurements	A	B	C	D	E	F
59.	Microwave Antennas	A	B	C	D	E	F
60.	Radar Fundamentals	A	B	C	D	E	F
61.	B/W TV Block	A	B	C	D	E	F
62.	B/W TV Circuits	A	B	C	D	E	F
63.	Color TV Block	A	B	C	D	E	F
64.	Color TV Circuits	A	B	C	D	E	F
65.	B/W TV Theory	A	B	C	D	E	F
66.	Color TV Theory	A	B	C	D	E	F
67.	CATV Concepts	A	B	C	D	E	F
68.	CCTV Concepts	A	B	C	D	E	F
69.	Speakers & heatsets	A	B	C	D	E	F
70.	Microphones	A	B	C	D	E	F
71.	Magnetic Recording-Audio	A	B	C	D	E	F
72.	Magnetic Recording-Video	A	B	C	D	E	F
73.	Stereo Systems and Components	A	B	C	D	E	F
74.	Telephone equipment and principles	A	B	C	D	E	F
75.	Broadcast station overview	A	B	C	D	E	F
76.	Audio Mixers and Bridging	A	B	C	D	E	F
77.	Audio Visual Equipment	A	B	C	D	E	F
78.	General Alignment Procedures	A	B	C	D	E	F
79.	General Troubleshooting Techniques	A	B	C	D	E	F
80.	Operational Checks (e.g. trapezoidal mod. check)	A	B	C	D	E	F
81.	FCC Questions and Answers	A	B	C	D	E	F
82.	Communications IC Circuits	A	B	C	D	E	F
83.	Overview of a typical complete comm. system	A	B	C	D	E	F
84.	Amateur Radio	A	B	C	D	E	F
85.	Citizens Band Radio	A	B	C	D	E	F
86.	Radio telegraph principles	A	B	C	D	E	F
87.	Radio Aids to Navigation	A	B	C	D	E	F
88.	Direct Conversion Receivers	A	B	C	D	E	F
89.	The Radio Frequency Spectrum	A	B	C	D	E	F
90.	Fourier Analysis	A	B	C	D	E	F

91.	Distortion	A	B	C	D	E	F
92.	Noise Problems	A	B	C	D	E	F
93.	Pulse Modulation (PCM, PPM, PWN)	A	B	C	D	E	F
94.	Pulse Modulation Circuits	A	B	C	D	E	F
95.	Frequency and Time Division Multiplexing	A	B	C	D	E	F
96.	A/D Conversion	A	B	C	D	E	F
97.	Telemetry Principles	A	B	C	D	E	F
98.	Crystals (Piezoelectric Theory)	A	B	C	D	E	F
99.	CW Principles	A	B	C	D	E	F
100.	Spectrum Analysis	A	B	C	D	E	F
101.	Data transmissions	A	B	C	D	E	F
102.	Transducers	A	B	C	D	E	F
103.	FCC Rules & Regulations	A	B	C	D	E	F
104.	Need for modulation	A	B	C	D	E	F
105.	Power amps	A	B	C	D	E	F
106.	Voltage amps	A	B	C	D	E	F
107.	Facsimile	A	B	C	D	E	F
108.	Frequency Domain Presentations	A	B	C	D	E	F
109.	Space communications	A	B	C	D	E	F
110.	Medical monitoring	A	B	C	D	E	F
111.	Radio controlled devices	A	B	C	D	E	F
112.	Military communications equipment	A	B	C	D	E	F
113.	Radar	A	B	C	D	E	F
114.	Sonar	A	B	C	D	E	F
115.	Remote sensing	A	B	C	D	E	F
116.	Electronic Security Systems	A	B	C	D	E	F
117.	Laser communications	A	B	C	D	E	F

Others (specify):

118.		A	B	C	D	E	F
119.		A	B	C	D	E	F
120.		A	B	C	D	E	F
121.		A	B	C	D	E	F
122.		A	B	C	D	E	F
123.		A	B	C	D	E	F
124.		A	B	C	D	E	F
125.		A	B	C	D	E	F

Comments on this section:

d. How important do you feel each of the following types of treatments are in a communications text? (circle one)

Key: A = Essential
B = Very Important
C = Somewhat Important
D = Not Important
E = No Opinion

(a)	Mathematical proofs and derivations	A	B	C	D	E
(b)	Theoretical explanations	A	B	C	D	E
(c)	Analysis of typical representative circuits	A	B	C	D	E
(d)	Survey treatment of all but the most important topics	A	B	C	D	E
(e)	Underlying electrical fundamentals stressed	A	B	C	D	E
(f)	Coverage of specific industrial devices and applications	A	B	C	D	E
(g)	Treatment should be laboratory oriented and all key ideas verified in lab	A	B	C	D	E
(h)	Newest devices should get complete coverage	A	B	C	D	E

Others (specify):

(i)		A	B	C	D	E
(j)		A	B	C	D	E
(k)		A	B	C	D	E
(l)		A	B	C	D	E
(m)		A	B	C	D	E

Comments on this section:

9. Do you feel this questionnaire provided adequate means for you to express your opinion on communications texts? (check one)

_____ yes, completely

_____ no, not at all

_____ in most areas

_____ in few areas

10. Comments concerning this questionnaire, communications textbooks, or the communications field in general:

USE THIS SPACE TO EXPAND UPON ANY AREA THAT YOU DID NOT HAVE ENOUGH ROOM FOR IN THE QUESTIONNAIRE. PLEASE DENOTE WHICH QUESTION YOU ARE ADDING TO OR ANSWERING.

THANK YOU FOR YOUR TIME IN FILLING OUT THIS QUESTIONNAIRE!

Dear Sir:

I am an electronics communications instructor in a college program, as you are. In recent years I have become more and more dissatisfied with the communications textbooks on the market in that none really seem to fit a survey communications course as I feel it should be structured. Having heard this same complaint from others at conferences and meetings, I am wondering if this may be a nationwide problem.

I thought it would be very valuable to all of us in this position to know just what is considered important in a communications course and what characteristics a textbook should have to meet these needs.

I have therefore determined to contact a representative sample of communications teachers around the country in an attempt to answer these questions.

The sample, although representative and diverse, is relatively small and it is therefore very important to the study that you take a few moments to respond.

I know you will be interested in the results of this survey and they will be sent to all respondents as soon as they are available. Again may I encourage you to respond right now while you are thinking of it. Thank you for your time and I hope the results of this survey will prove beneficial to you in the improvement and future development of your communications course.

Sincerely,

Steve Cheshier
Assistant Professor
Electrical Technology
Michael Golden Labs
Purdue University
West Lafayette, Indiana 47907

P.S. Please note that there is an addressed, stamped envelope included for your convenience in returning the questionnaire.

Dear Sir:

Recently I mailed a questionnaire to you which I feel is very important not only to me but to electrical/electronics technology teachers in general. The questionnaire dealt with the proper makeup of a satisfactory electronic communications textbook.

Realizing how busy and hectic the early weeks of a school year can be, I am sure you have misplaced the questionnaire or perhaps put it aside for later consideration. Would you please take a moment now to fill out the enclosed questionnaire and drop it in a mailbox? This will be very beneficial to me and, if you like, I will send you the survey results so that you may benefit as well.

If there is an objection which you might have to filling out the questionnaire, would you take a moment to relate your feelings to me? If your school does not offer this program, please return the questionnaire anyway and so indicate. Thank you very much.

Sincerely,

Steve Cheshier
Assistant Professor
Electrical Technology
Michael Golden Labs
Purdue University
West Lafayette, Indiana 47907

Dear Electronics Teacher:

Recently you participated in a study concerning desirable characteristics of electronic communications textbooks. The study is now completed and, although the complete study is nearly 100 pages long, I knew you would be interested in at least a brief summary of the key findings.

The four most popular textbooks, in order of preference, were Kennedy, DeFrance, Shrader and Mandl. Kennedy is being used by about 40% of the sample.

Concerning the inadequacy of pre. nt textbooks a full 62% of the group felt that their current book is either satisfactory or poor with only 9% finding it to be exceptionally good.

It was found that communications teachers have been changing texts an average of once every 1.39 years (about every 3 full semesters). The mean for the number of years which teachers have been teaching electronic communications was 4.47 years.

Significant weaknesses in current texts were: 1) the appropriateness of the math treatment, 2) the appropriateness of the depth of theoretical presentation, 3) the usefulness of practical real world examples, 4) the usefulness of problems and questions and 5) the popularity of the book with students.

Significant strengths cited were: 1) the author's clarity of expression, 2) coverage of the proper subjects, 3) the up-to-date nature and relevance of current books and 4) the technology orientation of available books.

Concerning the format of a desirable new text it was agreed by the respondents that the following should be included (in order of popularity): 1) chapter overviews, 2) end of chapter questions, 3) end of chapter problems, 4) photos and drawings and 5) sections of definitions. It was also agreed that end of topic questions were not desirable. Other characteristics drew a borderline agreement. Behavioral objectives were deemed important by about half the group.

117 items were listed which the respondents ranked in importance for inclusion into a textbook. Those topics which all agreed were essential or very important are listed below in the order of preference:

Areas of Agreement Concerning
Desirable Text Topics

Essential Topics	
Item	Topic
41	FM Theory
44	FM Block Diagram
29	AM Theory
14	Detector Circuits
43	FM receiver circuits
42	FM transmitter circuits
8	Balanced Modulators
27	Circuits built around FET's
30	AM transmitter circuits
31	AM receiver circuits
38	SSB principles
26	Circuits built around bipolar transistors
47	Phase Modulation concepts
28	Circuits built around IC's
12	Impedance Matching
7	Frequency Multipliers and Dividers
32	Superheterodyne Block Diagram
92	Noise Problems
93	Pulse Modulation (PCM,PPM,PWN)
13	Tuned Amplifiers
9	Low, High, Pass, Reject Filters
2	RF and Audio Amps
95	Frequency and Time Division Multiplexing
40	SSB Circuits
1	Oscillators
3	Coupling Methods
108	Frequency Domain Presentations
19	Amplifier Frequency Characteristics
35	Superhet circuits
53	Transmission Line Applications
105	Power amps
52	Transmission Line Principles
45	Stereo FM principles
104	Need for modulation
82	Communications IC Circuits
83	Overview of a typical complete comm. system
89	The Radio Frequency Spectrum
94	Pulse Modulation Circuits
24	Wideband Amplifiers
91	Distortion
65	B/W TV Theory
100	Spectrum Analysis
106	Voltage amps
4	Classes of Amplifiers
18	Operational Amplifiers
23	Varactor Circuits

Essential Topics	
Item	Topic
51	Propagation of Radio Waves
20	Decibels
50	Antenna Characteristics
63	Color TV Block
101	Data transmissions
48	Antenna Theory
66	Color TV Theory
49	Antenna Types
90	Fourier Analysis
109	Space communications
58	Microwave Measurements
60	Radar Fundamentals
54	Smith Chart
59	Microwave Antennas

Finally the respondents were asked to cons er various types of treatments for their desirability in a textbook. Those items which were agreed by all to be essential or very important are listed below in order of preference: 1) theoretical explanations, 2) analysis of typical representative circuits, 3) underlying electrical fundamentals stressed, 4) treatment should be laboratory oriented and all key ideas verified in lab and 5) newest devices should get complete coverage.

In addition, many valuable comments and suggestions were made and the author is very grateful for the participation of all of you in the study. Many valuable insights were gained and this information will be most useful as I prepare a new textbook in this area. Thanks very much!

Should you require a complete text of the study, it can be supplied but due to its length and the limited facilities which the author has access to, it will be necessary to charge $10 to cover the cost of duplicating, binding and first class mailing.

Sincerely,

Stephen R. Cheshier
Assistant Professor
Electrical Technology
Michael Golden Labs
Purdue University
West Lafayette, Indiana 47907

Comments received on item 5A in the questionnaire:

1. "Too low an academic level for a senior technology communications course." (Kennedy)
2. "Lacks extent of topics but has some analysis. Not too mathematical for the average student." (Mandl)

Comments received on item 5B in the questionnaire:

1. "The book was intended for first and second year college and technical institute students." (Kennedy)
2. "Could be more technology oriented." (Kennedy)
3. "The text is not relevant in several areas we feel are important. Some are left out completely." (Kennedy)
4. "Likability by students may be due to fact that Kennedy text replaced two former texts, i.e. cheaper for students."
5. "The book is occasionally incorrect in commercial applications." (Taub & Schilling)
6. "After the course I have given the students all of the available books, then asked for a recommendation. They say they don't really like the text but it is better than the others." (Kennedy)
7. "The book doesn't cover enough." (Clerke & Hess)
8. "Students have difficulty following many circuit explanations. An improved lab would help this." (Kennedy)
9. "Kennedy will be used in the future." (instead of Malvino)

Comments received on item 6 in the questionnaire:

1. "What are behavioral objectives?"
2. "We feel that a chapter or section should pretty much stand alone as far as that particular material is concerned, but you can't get away from information in one section having some effect on others."

Comments relating to item 7 on the questionnaire:

1. "Coverage of all this material to the degree indicated is very difficult in a 2 year program. We use 4 courses at our school to cover this material: Communications, TV, UHF and Microwave and Pulse Circuits."
2. "The list above is very comprehensive. In judging the importance of the various topics I was torn between my interest in a topic and whether the topic is relevant to the FCC exam. Personally I feel the FCC tests should be made more relevant to modern communications."
3. "I don't think FCC material should be in the same book due to the completely outdated (all tube) material required. It is a waste of time, except for the license, to study tube circuits in the detail required."
4. "Topics 61-68, 81, 97, 100, 103, 107, 110, 112 and 116 should be covered in another text."
5. "I do not want too comprehensive a text for one course in communications. 3 communications courses are taught at my institute: transmission lines prior to communications systems and microwaves after. Students should be familiar with attenuators, amplifiers and power supplies prior to taking a communications course."
6. "Topics 1-7, 12, 17, 19, 20 and 24 should be taught in a prerequisite course. Topics 48-68, 71, 72 and 113 should be taught in secondary communications courses."
7. "Topics 48-60 should be in a microwave book."

8. "While I feel that a course in microwaves is essential, I would like to separate the terminal topics from the propagation topics. I don't feel an adequate job on microwaves can be done within the space limitations of 2 or 3 chapters in a broad scope text."
9. "The material here is divided into about 4 courses at our school."
10. "Power supplies and classes of amplifiers are usually taught in previous courses."
11. "Microwave and TV should be separate books."
12. "Topics 55 through 66 and 77 and 109 should be treated in a different book."
13. " We provide a survey of communications course at the 2 year level. Theory and circuits are in other courses."
14. "Some of these topics covered in other courses."
15. "I would change option D on this question to read - could be mentioned subject to space and interests of the author."

Comments by respondents relating to item 8 on the questionnaire:

1. "When teaching technicians to be, all math presented must be clearly demonstrated to have practical application. Only engineers can really grasp and appreciate concepts."
2. "Basic theory should have been covered in a previous course but briefly reviewed here if necessary."
3. "The objective of an electronics communication textbook should be to present useful analysis-design techniques leading to a practical application complete design."
4. "I had the FCC exams in mind when answering the above. For the student with interest and ability, I try to give them extra work and outside reading in the area of proofs, derivations and theory."

Overall comments received from the respondents concerning the instrument (item 10):

ECPD Group

1. "I will be making a text change next semester to either Sentz or Mandl."
2. "More power to you."
3. "I'd like to see a text that better illustrates real world systems as opposed to fancy theory."
4. "Thanks for asking these questions."
5. "Need a text which balances between theory and real world. For EET programs need emphasis on concepts, useful tools (such as Fourier and Spectrum analysis) and new treatment of RF technology."
6. "We have relied on the Amateur Radio Handbook as a supplement to our regular text. We have used many handouts to supplement the text and have talked about writing one but have not worked in the time to do it."
7. "Most of the communications books I have seen stressed either communications circuits or communications broadcast theory but not both. I would like to see a book that would give a very good treatment of the basic communications circuits (tuned amp, oscillator, class "C" amp etc.) along with the modulation theory. While I use the Kennedy book, it is supplemented with many handouts. Good luck to you on your attempt to solve this problem."
8. "Communications texts for our program are presently at a level too high or too low. We have generally been selecting the lower level books and augmenting the math in those areas we

feel to be important. We feel a definite need for an intermediate level communications book."

9. "I feel that a survey course like I teach should be constrained to block diagram form. It would be impossible to cover all of the variations in circuits used. I feel that to be able to know what goes into a block (frequency spectrum as well as time domain) and what comes out of the block, is much more important. This way AM, AMDSSC, SSB, FM, FM Stereo, SCA and maybe TV could be presented with a great deal of understanding.
10. "We have expressed a comparative evaluation of the topics mentioned. The amount of coverage would be determined by the size of the book you wish to write. In some cases there was a duplication of questions and our first impressions were given."
11. "Since the course sequences vary so much from school to school, it is difficult to answer some of the questions except as they relate to our curriculum. For example, we require some electromagnetic background prior to taking our communications course."
12. "Any attempt to cover all or most of the topics listed in questions 7 would result in an unusable text. Antennas, lines, waveguides and propagation should be treated in their own course."
13. "Questionnaire is too long (refused to fill out). We are currently decreasing our instruction in communications. I am prepared to stop using texts. I don't think your project is all that important."

NON-ECPD Group

1. "Our school teaches communications in a 4 year B.S. program therefore our requirements differ from most. Amplifiers, feedback theory are pre-requisites. Digital circuits and pulse techniques, antennas, transmission lines, and microwaves are covered in other courses. If the text is to include these topics, the coverage should be sufficiently detailed to allow use in separate courses."
2. "A major objective of our communications systems course is preparation for the FCC First Class License Test."
3. "Questionnaire not designed for our communications courses which are in the B-Tech area, not A.A.S. We offer upper division only and most areas in question #7 are covered in prior courses or in other courses such as transmission lines, antennas, EM fields or microwaves."
4. "Questionnaire should specify the type of electronic communication program."
5. "Questionnaire should indicate the type of courses being discussed: lecture, lecture/lab or straight lab etc."
6. "We have to use a variety of books to find proper subject coverage."
7. "Any new communications text should include both analog and digital techniques."
8. "I have not taught communications as such for several years and have had difficulty finding a satisfactory combination of texts. The former teacher was strictly tube oriented. I would like to find a modern text giving equal coverage to basic circuits used in transmitters and receivers and solid

coverage of communications systems. Starting this year I will try Malvino plus Kennedy."

9. "I feel this questionnaire is an excellent idea. I am still a novice at teaching in this area but already have definite opinions on textbooks and course material. I feel DeFrance is the best of the textbooks I have looked at. Many students do not agree with me on this point."
10. "Excellent idea."

Computations for the correlation between the number of years teaching and the number of textbooks used. (Questionnaire items 3 and 4)

Number of Texts X	Number of Years Y	X^2	Y^2	XY
5	5	25	25	25
5	7	25	49	35
5	7	25	49	35
5	7	25	49	35
5	7	25	49	35
4	5	16	25	20
4	7	16	49	28
4	7	16	49	28
3	5	9	25	15
3	5	9	25	15
3	5	9	25	15
3	5	9	25	15
3	7	9	49	21
3	5	9	25	15
3	5	9	25	15
3	5	9	25	15
3	1.5	9	2.25	4.5
2	1.5	4	2.25	3.0
2	5	4	25	10
1	1.5	1	2.25	1.5
1	1.5	1	2.25	1.5
$\Sigma X=70$	$\Sigma Y=105$	$\Sigma X^2=264$	$\Sigma Y^2=602$	$\Sigma XY=387.50$

N=21

$$r = \frac{N \Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{[N \Sigma X^2 - (\Sigma X)^2]\ [N \Sigma Y^2 - (\Sigma Y)^2]}}$$

$$r = \frac{(21)(387.50) - (70)(105)}{\sqrt{[(21)(264) - (4900)]\ [(21)(602) - (11025)]}}$$

$$r = .77$$

The data gathered for questions 3 and 4 in the questionnaire is itemized below.

ECPD SAMPLE

Number of Texts	Number of Years Teaching	Years/Text
5 or more	7 or more	1.40
5 or more	7 or more	1.40
5 or more	7 or more	1.40
5 or more	7 or more	1.40
5 or more	4-6	1.00
4	7 or more	1.75
4	7 or more	1.75
4	4-6	1.25
3	7 or more	2.33
3	4-6	1.67
3	4-6	1.67
3	4-6	1.67
3	4-6	1.67
3	4-6	1.67
3	4-6	1.67
3	4-6	1.67
3	0-3	0.50
2	4-6	2.50
2	0-3	0.75
1	0-3	1.50
$\bar{X}_{NT}$= 3.33 texts	$\bar{X}_{YT}$= 5.00 years	$\bar{X}_{Y/T}$= 1.50

N_{ECPD} = 21 Average = 1.50 years/text

NON-ECPD SAMPLE

Number of Texts	Number of Years Teaching	Years/Text
5 or more	7 or more	1.40
5 or more	7 or more	1.40
4	4-6	1.25
4	4-6	1.25
3	4-6	1.67
3	0-3	0.50
3	0-3	0.50
2	0-3	0.75
2	0-3	0.75
1	0-3	1.50
1	0-3	1.50
$\bar{X}_{NT}$= 3.00 texts	$\bar{X}_{YT}$= 3.45 years	$\bar{X}_{Y/T}$= 1.15

$N_{NON-ECPD}$ = 11 Average = 1.15 years/text

Composite Average = $\frac{4.47 \text{ years}}{3.22 \text{ texts}}$ = 1.39 years/text

The Chi-Square technique was used to analyze the data in question 5 to see if the two groups of respondents were in agreement.

Chi-Square was computed from the following formula:

$$\chi^2 = \sum \frac{(O-E)^2}{E}$$

where O = observed frequency

E = expected frequency

The expected frequency table was computed according to the following tabular example:

Observed

	Yes	No	
ECPD	A	B	E
NON-ECPD	C	D	F
	G	H	M

Expected

	Yes	No
ECPD	$\frac{GE}{M}$	$\frac{HE}{M}$
NON-ECPD	$\frac{GF}{M}$	$\frac{HF}{M}$

df was 1 since each contingency table was

2x2 (df = (r-1)(c-1))

The critical value for the tests was 3.841 which is based on alpha = .05 and 1 degree of freedom. Thus any calculated value of χ^2 <u>less than</u> 3.841 will mean agreement exists.

<u>Question 5A</u>

Observed

		Yes	No	
(a)	ECPD	14	8	22
	Non-ECPD	8	3	11
		22	11	33
(b)	ECPD	14	8	22
	Non-ECPD	7	4	11
		21	12	33

Expected

	Yes	No	
ECPD	14.67	7.33	22
Non-ECPD	7.33	3.67	11
	22	11	33
ECPD	14	8	22
Non-ECPD	7	4	11
	21	12	33

(a) $\chi^2 = .28$

(b) $\chi^2 = 0$

(c)

Observed	Yes	No	
ECPD	11	11	22
Non-ECPD	4	7	11
	15	18	33

Expected	Yes	No	
ECPD	10	12	22
Non-ECPD	5	6	11
	15	18	33

$X^2 = .55$

(d)

Observed	Yes	No	
ECPD	18	4	22
Non-ECPD	7	4	11
	25	8	33

Expected	Yes	No	
ECPD	16.67	5.33	22
Non-ECPD	8.33	2.67	11
	25	8	33

$X^2 = 1.31$

(e)

Observed	Yes	No	
ECPD	14	8	22
Non-ECPD	10	1	11
	24	9	33

Expected	Yes	No	
ECPD	16	6	22
Non-ECPD	8	3	11
	24	9	33

$X^2 = 2.75$

(f)

Observed	Yes	No	
ECPD	11	10	21
Non-ECPD	7	4	11
	18	14	32

Expected	Yes	No	
ECPD	11.81	9.19	21
Non-ECPD	6.19	4.81	11
	18	14	32

$X^2 = .37$

Question 5B

(a)

Observed	Yes	No	
ECPD	17	4	21
Non-ECPD	8	3	11
	25	7	32

Expected	Yes	No	
ECPD	16.41	4.59	21
Non-ECPD	8.59	2.41	11
	25	7	32

$X^2 = .28$

(b)

Observed	Yes	No	
ECPD	19	2	21
Non-ECPD	7	4	11
	26	6	32

Expected	Yes	No	
ECPD	17.06	3.94	21
Non-ECPD	8.94	2.06	11
	26	6	32

$X^2 = 3.42$

(c)

Observed	Yes	No	
ECPD	11	6	17
Non-ECPD	7	3	10
	18	9	27

Expected	Yes	No	
ECPD	11.33	5.67	17
Non-ECPD	6.67	3.33	10
	18	9	27

$X^2 = .08$

Chi-Square calculations for questionnaire item six. (Expected frequencies and X^2 are computed as before: df = (4-1)(2-1) = 3.) Due to the extremely small frequency and irrelevance to the data, the "no opinion" column (E) was dropped from the contingency tables. For alpha = .05 and df = 3, the critical value is 7.82.

(a)

Observed

	A	B	C	D	
ECPD	4	7	3	6	20
Non-ECPD	1	6	1	3	11
	5	13	4	9	31

Expected

	A	B	C	D	
ECPD	3.23	8.39	2.58	5.81	20
Non-ECPD	1.77	4.61	1.42	3.19	11
	5	13	4	9	31

$X^2 = 1.$

(b)

Observed

	A	B	C	D	
ECPD	6	8	4	3	21
Non-ECPD	1	8	1	1	11
	7	16	5	4	32

Expected

	A	B	C	D	
ECPD	4.59	10.50	3.28	2.63	21
Non-ECPD	2.41	5.50	1.72	1.38	11
	7	16	5	4	32

$X^2 = 3.$

(c)

Observed

	A	B	C	D	
ECPD	5	8	6	3	22
Non-ECPD	1	7	2	1	11
	6	15	8	4	33

Expected

	A	B	C	D	
ECPD	4.00	10.00	5.33	2.67	22
Non-ECPD	2.00	5.00	2.67	1.33	11
	6	15	8	4	33

$X^2 = 2.$

(d)

Observed

	A	B	C	D	
ECPD	5	11	6	0	22
Non-ECPD	5	1	3	2	11
	10	12	9	2	33

Expected

	A	B	C	D	
ECPD	6.67	8.00	6.00	1.33	22
Non-ECPD	3.33	4.00	3.00	0.67	11
	10	12	9	2	33

$X^2 = 8$

(e)

Observed

	A	B	C	D	
ECPD	15	6	2	0	23
Non-ECPD	6	2	3	0	11
	21	8	5	0	34

Expected

	A	B	C	D	
ECPD	14.21	5.41	3.38	0	23
Non-ECPD	6.79	2.59	1.62	0	11
	21	8	5	0	34

$X^2 = 2$

(f)

Observed

	A	B	C	D	
ECPD	2	6	6	7	21
Non-ECPD	1	1	6	2	10
	3	7	12	9	31

Expected

	A	B	C	D	
ECPD	2.03	4.74	8.13	6.10	21
Non-ECPD	0.97	2.26	3.87	2.90	10
	3	7	12	9	31

$X^2 = 3.$

Observed

	A	B	C	D	
ECPD	6	4	9	3	22
Non-ECPD	1	3	3	2	9
	7	7	12	5	31

(g) Expected

	A	B	C	D	
ECPD	4.97	4.97	8.52	3.55	22
Non-ECPD	2.03	2.03	3.48	1.45	9
	7	7	12	5	31

$X^2 = 1.$

Observed

	A	B	C	D	
ECPD	5	4	5	8	22
Non-ECPD	2	3	4	2	11
	7	7	9	10	33

(h) Expected

	A	B	C	D	
ECPD	4.67	4.67	6.00	6.67	22
Non-ECPD	2.33	2.33	3.00	3.33	11
	7	7	9	10	33

$X^2 = 1.$

Observed

	A	B	C	D	
ECPD	18	4	1	0	23
Non-ECPD	8	1	2	0	11
	26	5	3	0	34

(i) Expected

	A	B	C	D	
ECPD	17.59	3.38	2.03	0	23
Non-ECPD	8.41	1.62	0.97	0	11
	26	5	3	0	34

$X^2 = 2.$

Observed

	A	B	C	D	
ECPD	9	8	4	0	21
Non-ECPD	2	7	1	1	11
	11	15	5	1	32

(j) Expected

	A	B	C	D	
ECPD	7.22	9.84	3.28	0.66	21
Non-ECPD	3.78	5.16	1.72	0.34	11
	11	15	5	1	32

$X^2 = 4.$

Observed

	A	B	C	D	
ECPD	1	7	7	6	21
Non-ECPD	2	3	4	2	11
	3	10	11	8	32

(k) Expected

	A	B	C	D	
ECPD	1.97	6.56	7.22	5.25	21
Non-ECPD	1.03	3.44	3.78	2.75	11
	3	10	11	8	32

$X^2 = 1.$

*Significant at the .05 level.

Complete Presentation of the Data
From Questionnaire Item 7

	ECPD Frequencies						Non-ECPD Frequencies					
Item	A	B	C	D	E	F	A	B	C	D	E	F
1	9	5	4	0	1	1	5	2	2	1	1	0
2	9	4	4	1	1	1	5	3	1	1	1	0
3	5	9	4	0	1	1	4	3	3	0	1	0
4	5	5	7	0	3	0	2	5	2	1	1	0
5	3	2	5	4	6	0	0	4	5	1	1	0
6	3	1	3	7	6	0	1	4	4	1	1	0
7	4	9	4	2	0	1	3	6	2	0	0	0
8	8	9	2	0	0	1	6	3	2	0	0	0
9	7	5	6	1	1	0	4	5	2	0	0	0
10	3	5	7	3	1	1	1	4	4	1	1	0
11	4	4	8	1	3	0	1	4	4	1	1	0
12	6	7	1	3	2	1	5	4	1	0	1	0
13	9	5	5	1	0	0	4	4	3	0	0	0
14	12	6	1	2	0	0	7	3	1	0	0	0
15	1	7	5	4	1	2	1	4	5	0	1	0
16	1	5	8	4	2	0	1	3	6	0	1	0
17	2	3	8	5	2	0	2	4	4	0	1	0
18	6	5	4	3	2	0	3	3	3	0	2	0
19	5	7	5	1	2	0	5	3	1	2	0	0
20	7	5	6	0	3	0	3	2	4	1	1	0
21	5	6	7	1	1	0	2	2	6	1	0	0
22	5	3	7	4	1	0	2	4	4	1	1	0
23	5	4	7	2	2	1	3	4	3	1	0	0
24	5	5	8	1	2	1	2	6	1	1	1	0
25	1	4	4	6	6	0	0	2	3	6	0	0
26	8	6	4	1	1	1	4	6	1	0	0	0
27	8	7	2	1	1	1	2	8	1	0	0	0
28	9	5	2	1	1	1	4	4	3	0	0	0
29	12	8	0	0	0	1	7	3	0	1	0	0
30	6	10	2	1	0	1	5	4	2	0	0	0
31	5	11	2	1	0	1	4	5	2	0	0	0
32	10	6	2	1	0	1	4	3	3	1	0	0
33	1	6	4	6	2	1	2	2	2	3	1	1
34	2	5	4	6	2	1	2	0	7	1	1	0
35	7	5	5	2	0	1	4	3	1	3	0	0
36	0	4	6	7	2	1	2	0	3	3	1	2
37	0	6	3	8	2	1	1	1	6	2	0	1
38	10	7	1	1	0	1	4	4	3	0	0	0
39	9	6	2	2	0	1	2	7	2	0	0	0
40	6	5	5	3	0	1	3	6	2	0	0	0
41	15	4	0	0	0	1	7	4	0	0	0	0
42	6	9	2	1	0	1	4	6	1	0	0	0
43	8	8	2	1	0	1	4	6	1	0	0	0
44	11	7	1	0	0	1	6	4	0	0	0	1
45	8	6	4	1	0	1	2	3	5	0	0	1
46	8	2	3	4	0	3	0	1	5	1	0	4
47	9	6	2	1	1	1	5	3	3	0	0	0
48	7	3	5	1	3	1	3	2	3	2	1	0
49	5	4	5	2	3	1	1	4	3	2	1	0

Item 7 (continued)

Item	ECPD Frequencies						Non-ECPD Frequencies					
	A	B	C	D	E	F	A	B	C	D	E	F
50	6	3	6	1	3	1	1	5	2	2	1	0
51	5	3	5	4	2	1	3	4	1	2	1	0
52	6	5	0	3	4	2	3	4	1	2	1	0
53	6	6	0	2	5	1	3	4	1	2	1	0
54	4	5	1	4	5	1	2	2	2	3	2	0
55	3	1	3	3	9	0	1	4	3	2	1	0
56	2	2	5	2	9	0	0	5	3	2	1	0
57	2	3	4	2	9	0	1	4	3	2	1	0
58	2	4	2	3	9	0	0	6	2	2	1	0
59	1	4	4	2	9	0	1	4	2	2	1	1
60	2	4	2	2	10	0	2	4	2	2	1	0
61	3	3	5	4	5	0	2	4	1	3	0	1
62	2	3	5	5	5	0	1	3	2	4	0	1
63	4	2	6	3	4	1	2	5	0	3	0	1
64	3	2	6	4	4	1	1	4	2	3	0	1
65	3	6	3	3	4	1	1	6	0	3	0	1
66	4	3	5	3	4	1	1	5	1	3	0	1
67	2	1	6	7	3	1	0	4	3	3	0	1
68	1	2	4	8	3	2	0	4	3	3	0	1
69	0	4	4	8	5	1	0	2	5	3	0	1
70	0	3	6	5	6	0	0	3	5	3	0	1
71	0	2	4	6	7	1	1	2	5	2	0	1
72	0	2	5	6	6	1	0	3	5	2	0	1
73	2	3	4	5	6	0	0	3	4	3	0	1
74	1	1	5	9	4	0	0	2	4	4	0	1
75	1	5	4	7	3	0	1	1	3	5	0	1
76	0	5	4	6	5	0	1	2	3	5	0	0
77	0	1	2	8	7	2	0	0	4	5	1	1
78	1	3	5	8	2	1	0	5	2	3	1	0
79	1	5	4	5	3	1	1	3	3	3	1	0
80	2	4	9	2	2	1	0	5	3	2	1	0
81	0	3	4	4	8	1	1	5	1	4	0	0
82	8	6	3	2	0	1	2	3	4	1	0	1
83	7	6	1	2	2	1	4	2	4	1	0	0
84	0	1	1	5	12	1	0	1	4	6	0	0
85	0	0	1	4	13	1	0	1	4	6	0	0
86	1	1	3	5	9	1	0	2	5	4	0	0
87	0	1	5	8	5	1	1	1	4	5	0	0
88	0	2	5	8	3	2	0	1	7	2	0	1
89	5	8	3	3	0	1	1	5	5	0	0	0
90	7	4	4	2	3	0	4	0	5	1	1	0
91	7	2	7	2	2	0	4	4	1	2	0	0
92	8	5	5	1	1	0	6	3	2	0	0	0
93	9	5	3	2	0	1	4	4	1	2	0	0
94	6	6	3	3	0	2	2	4	3	2	0	0
95	8	5	3	2	1	1	4	4	2	0	1	0
96	6	1	3	5	3	2	3	0	6	1	1	0
97	4	3	5	3	3	2	2	2	4	3	0	0
98	1	5	5	6	3	0	1	1	6	3	0	0
99	5	2	5	5	0	3	1	4	4	2	0	0

Item 7 (continued)

Item	ECPD Frequencies						Non-ECPD Frequencies					
	A	B	C	D	E	F	A	B	C	D	E	F
100	7	3	6	2	1	1	4	3	4	0	0	0
101	6	3	5	4	1	1	2	4	4	1	0	0
102	1	4	6	5	4	0	0	3	7	0	1	0
103	1	2	2	5	9	1	1	3	3	4	0	0
104	11	4	2	2	0	1	1	4	5	1	0	0
105	7	5	2	2	3	1	3	4	3	1	0	0
106	6	4	2	3	4	1	3	4	2	2	0	0
107	1	1	5	6	4	3	0	3	4	4	0	0
108	8	5	2	1	2	2	4	3	4	0	0	0
109	1	7	5	3	3	2	1	4	2	3	1	0
110	1	7	1	6	3	1	0	3	3	3	1	1
111	1	3	4	8	1	3	0	3	4	4	0	0
112	0	2	4	6	6	2	0	2	3	5	0	1
113	2	3	5	4	5	1	1	2	3	3	1	1
114	1	2	6	5	5	1	1	2	3	2	2	1
115	0	2	6	6	4	2	0	2	4	3	1	1
116	0	2	3	8	6	1	0	2	3	4	1	1
117	1	3	6	7	2	1	0	4	1	5	0	1

Statistical computations concerning "agreement" or "disagreement" for the data in Table 9 (dealing with Question 7 in the instrument).

The values of Student's t and w were calculated at both the .05 and .01 alpha levels for all combinations of sample size (non-ECPD = N_1, ECPD = N_2) so that the Lawshe-Baker Nomograph (reproduced below) could be entered to determine agreement or disagreement.

The following formulas were used in the computations:

$$t = w\sqrt{\frac{2(N_1)(N_2)}{N_1 + N_2}}$$

so

$$w = \frac{t}{\sqrt{\frac{2(N_1)(N_2)}{N_1 + N_2}}}$$

and $$df = (N_1 - 1) + (N_2 - 1)$$

		Critical Values				
		t		w		
		=.05	=.01	=.05	=.01	df
$N_1 = 7$	$N_2 = 17$	2.074	2.819	0.66	0.90	22
$N_1 = 7$	$N_2 = 18$	2.069	2.807	0.65	0.88	23
$N_1 = 7$	$N_2 = 19$	2.064	2.797	0.65	0.87	24
$N_1 = 7$	$N_2 = 20$	2.060	2.787	0.64	0.87	25
$N_1 = 7$	$N_2 = 21$	2.056	2.779	0.63	0.86	26
$N_1 = 9$	$N_2 = 17$	2.064	2.797	0.60	0.82	24
$N_1 = 9$	$N_2 = 18$	2.060	2.787	0.59	0.80	25
$N_1 = 9$	$N_2 = 19$	2.056	2.779	0.59	0.80	26
$N_1 = 9$	$N_2 = 20$	2.052	2.771	0.58	0.79	27
$N_1 = 9$	$N_2 = 21$	2.048	2.763	0.58	0.78	28
$N_1 = 10$	$N_2 = 17$	2.060	2.787	0.58	0.79	25
$N_1 = 10$	$N_2 = 18$	2.056	2.779	0.57	0.78	26
$N_1 = 10$	$N_2 = 19$	2.052	2.771	0.57	0.77	27
$N_1 = 10$	$N_2 = 20$	2.048	2.763	0.56	0.76	28
$N_1 = 10$	$N_2 = 21$	2.045	2.756	0.56	0.75	29
$N_1 = 11$	$N_2 = 17$	2.056	2.779	0.56	0.76	26
$N_1 = 11$	$N_2 = 18$	2.052	2.771	0.56	0.75	27
$N_1 = 11$	$N_2 = 19$	2.048	2.763	0.55	0.74	28
$N_1 = 11$	$N_2 = 20$	2.045	2.756	0.54	0.73	29
$N_1 = 11$	$N_2 = 21$	2.042	2.750	0.54	0.73	30

The Lawshe-Baker nomograph below was reproduced from page 192 in the book by Downie. The two percentages, p_1 from the ECPD group and p_2 from the non-ECPD group are connected with a straight edge then the value of omega (w) on this line is compared to the critical value of w (above) for significance.

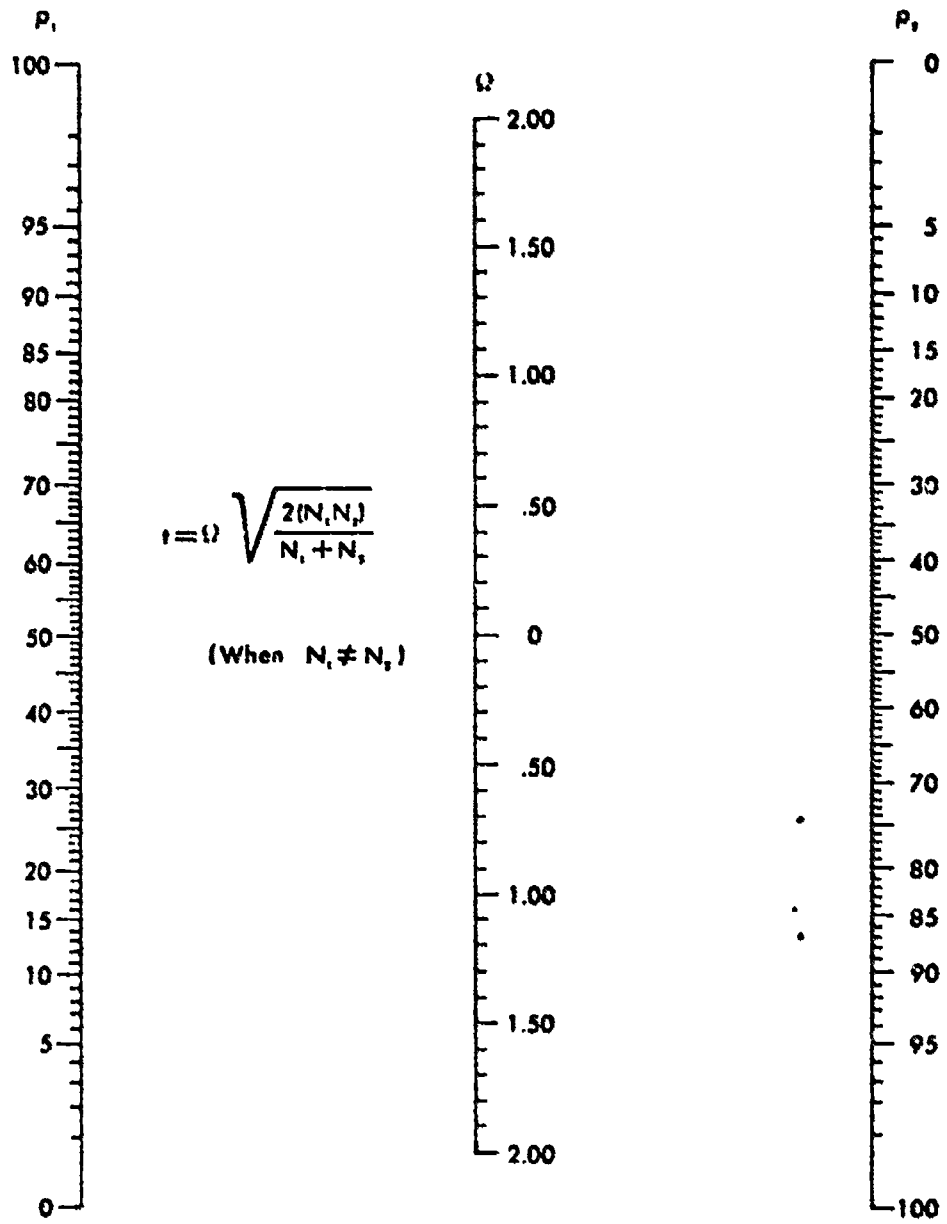


Fig. 13.2. Lawshe-Baker Nomograph for testing the significance of the difference between two percentages (by permission of Dean C. H. Lawshe).

Responses to item 8 in the questionnaire:

	ECPD Group				
Item	A Essential	B Very Important	C Somewhat Important	D Not Important	E No Opin
(a)	3	8	8	2	0
(b)	7	10	4	0	0
(c)	10	7	2	1	0
(d)	1	7	9	3	1
(e)	9	8	3	1	0
(f)	2	4	9	5	1
(g)	3	8	8	2	0
(h)	7	5	8	0	0

Non-ECPD Group

Item	A Essential	B Very Important	C Somewhat Important	D Not Important	E No Opin
(a)	4	2	5	0	0
(b)	4	7	0	0	0
(c)	5	3	2	0	1
(d)	1	6	3	1	0
(e)	3	4	2	1	1
(f)	0	4	4	3	0
(g)	6	4	0	1	0
(h)	2	6	2	0	1

Computational data for Table 12 relating to questionnaire item 8:

N_1	N_2	=.05	=.01	=.05	=.01	df
10	20	2.048	2.763	0.56	0.76	28
10	21	2.045	2.756	0.56	0.75	29
11	20	2.045	2.756	0.54	0.73	29
11	21	2.042	2.750	0.54	0.72	30

The values of N_1 and N_2 are all combinations occurring in the table between the non-ECPD sample (N_1) and the ECPD (N_2). The values of Student's t were taken from standard statistical tables. w was calculated as before from the following formula:

$$w = \frac{t}{\sqrt{\frac{2(N_1)(N_2)}{N_1 + N_2}}}$$

and $df = (N_1 - 1) + (N_2 - 1)$

Again the Lawshe-Baker Nomograph was used to determine which percentage combinations (p_1 and p_2) between the two groups represented significant difference.